Smallholder Sugarcane Growers, Indigenous Technical Knowledge, and the Sugar Industry Crisis in Fiji

A THESIS
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DEDICATION

This thesis is dedicated to the sugarcane farmers whose hard work and perseverance continue to immensely contribute to the economy and the development of Fiji, in particular to all those who continue to work strenuously to salvage the sugar industry.

ABSTRACT

This is a cross-disciplinary study that draws upon the agronomic, ecological, and social sciences to analyse the current crisis facing the sugar industry in Fiji. Its particular focus is the livelihood crisis facing the smallholder sugarcane growers, and it explores the potential of their local and traditional farming knowledge as a source of solutions for both crises. It argues, however, that present proposals for reforming the sugar industry in Fiji are wedded to the industrial agricultural paradigm and a globalized corporate food regime that is the source of the problems it currently faces and which threatens the future of the smallholder sugarcane farming system along with its local traditional knowledge. The thesis draws inspiration from Agroecology as an agricultural paradigm alternative to the conventional industrial paradigm to advocate for greater attention to be given to smallholder sugarcane growers and their local and traditional farming knowledge in seeking solutions to the crisis of the sugar industry in Fiji.

To explore these complex issues, the thesis adopts a cross-disciplinary, mixed-method approach. Participant observation, focus group discussions, and informal interviews with smallholder sugarcane farmers were used to elicit their views, feeling, thoughts and opinions on the Fiji sugar industry, their relationships with other sugar industry actors, and their own indigenous technical knowledge. Livelihood survey methods and agroecosystem analysis were used to gather quantitative data on household and farm status. This information was analysed using IBM® Social Science software: Statistical Package for Social Sciences (SPSS) and Microsoft® Office Excel Spreadsheet, to provide an up-to-date profile of livelihood and farming situation of smallholder sugarcane growers. Semi-structured interviews with industry stakeholders were used to identify the agricultural problems and socio-economic issues facing the industry and their differing views on the solutions proposed to solve them. Archival material was used to obtain information on past efforts of the sugar industry to develop solutions to problems at the local, national and international levels, and existing academic literature was reviewed for additional information on the contemporary situation of the smallholder sugarcane growers and the Fiji sugar industry as a whole.

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Glossary

Aayats	Verses of the Quran
Allah Shafi, Allah mafi	Allah provide cure and forgive
Andras	Pineapple
Arakasi	A single bladed Lesters cultivator
Arhar	Pigeon peas
Baakham	Process of cleaning cane stalks off leaves
Bade peer	A Muslim Seer
Bagasse	A biomass by-product of sugarcane processing
Bedh	Plot
Bali/balis	Internode of cane stalk
Bhalo	Manual opening of cane rows using cane knife for during harvesting
Biaas	Germination of more cane shoots
Bilni	Eye illness more commonly 'eyelid inflammation'
Boda	Cow peas
Chintaani matti	Brownish to reddish colour soil with non-porous sticky properties
Choki	Small cane shoots
Churi chalao	A process of clearing weeds in the cane fields
Collumbar	Field officer
Dharis	Rows of canes along the edges of the farm
Dhela(s)	Big chunks of soil
Fulawa	Hand ard
Girmit	Corruption of the word 'agreement'
Girmitiya(s)	People brought from Colonial India to work on the sugarcane plants in Fiji by the British
Gulli(s)	Nodes of the cane stalk
Ghaseeta	A form of sled
Hangaow	A process involving vigorous turning and mixing of soft sandy soil
Halwa	A dish made from semolina, ghee and sugar, garnished with dried fruits and nuts
Harai pura bera	Meaning, if the rows of newly germinated cane plants in the farms are running from north to south then the farmer needs to hanger the farm from east to west or west to east
Hevd	To distribute
Hukmaan	A cane farmer responsible for overseeing of activities of the 'gang' during harvesting period when the *sirdar* is absent from the field

iSevusevu	A traditional native Fijian ceremony for welcoming visitors
iTaukei	Denotes the indigenous population of Fiji.
iTokatoka	One or more form of *iTaukei* extended family units
Ittar	A common type of perfume/scent used in the Muslim world
iQoliqoli	Traditional *iTaukei* fishing grounds in Fiji
Jaha se aya hai waha pe laut jao	Wherever you originated from, go back to your original place
Janmashtami/Asthami	A Hindu celebration recognising the birth of Lord Krishna
Kantaap	Cane Top
Khujji	Cane grains
Khurkhuraiya	Furrow
Kiuva	A cane variety launched in 2009
Kudari	Hoe
Kuthi ganna	Second ratoon cane crop
Lolo	Coconut cream
Lovo	A traditional food cooked in the earth
Maaf	Forgive
Maryalam Muslim	Fiji Muslims having links to South India
Mataqali	A Fijian clan or landowning unit.
Matti kholo	Opening the soil
Misri	Cane sugar cubes
Molbih/Mullah	A Muslim Priest
Murda khet	Dead farm
Nas	Cane Stalk vascular bundle
Naya kallas	First new shoots
Neem	*Azadirachta indica*, also known as Neem, Nimtree, Ineem and Indian Lilac, is a tree in the mahogany family native to the Indian subcontinent.
Nikaah	Marriage
Nimak	Urea
Pahi(s)	Row
Pakki lines	Tram line
Paniwala	A person responsible for providing refreshments to the labourers and cane cutters during harvesting
Parthi	fallow
Patimaar	refer *baakham*
Patti girao	refer *baakham*
Peelaat ganna	Seed cane from first ratoon
Potus	Potash
Pulai	Small cane shoot

Pulau	A type of traditional Muslim food made in Fiji mostly during traditional occasions
Raatib	A forms of a Muslim ritual
Rakhi	Millmud/Ash
Qamea	A new cane variety (LF94-694)
Sannaka khet	Fertile and strong cane fields
Shifa	Cure
Shudh	Pure
Sinni	Collective term for refreshments such as *halwa, misri,* fruits, etc.
Sirdar	The individual cane growers who head the activities of their gang
Sukhlai	A farming activity that requires supplying the plot with a germinating ratoon
Sui	Brix meter
Suplai	refer *sukhlai*
Sutlej V	The last ship that brought indentured labourers to Fiji
Taasid nai rehwe	Not strong enough
Tamtam	Process of removing half of an old cane ratoon with its shoots and stem still intact to the root system and imbedding it to plots where the new cane seeds have not germinated
Taukei	Land
Turaga ni koro	Village chief
Tilla	Small cane shoots
Ujjar masala	Urea
Vanua	A collection of *iTaukei* clans established through descent from a common ancestor
Viwa	A new cane variety (LF04-448)
Vetiver	A type of grass having deep rooting systems
Yavusa	Tribe

List of Abbreviations

AD	Anno Domini
ACP	African, Caribbean and Pacific Groups of Countries
AFS	Amalgamated Farming System
AKST	Agricultural Knowledge, Science and Technology
ALTA	Agricultural Landlord and Tenants Act
ALTO	Agricultural Landlord and Tenant Ordinance
AMSP	Accompanying Measures for Sugar Protocol
ANAP	National Association of Small Farmers
BC	Before Christ
CAC	Campasino-a-Campasino Movement
CBD	Convention on Biological Diversity
CCS	Credit and Service Cooperatives
CPA(s)	Cane Producer Association
CPA(s)	Agricultural Production Cooperatives
CSA	Commonwealth Sugar Agreement
CSR	Colonial Sugar Refinery
DWG	Demographic Working Group
EBA	Everything but Arms
EC	European Communities
EEC	European Economic Community
EPA	Economic Partnership Agreement
EU	European Union
FAO	Food and Agriculture Organization
FDB	Fiji Development Bank
FEA	Fiji Electricity Authority
FLGD	Fiji Leaf Gall Disease
FNU	Fiji National University
FSC	Fiji Sugar Corporation
FT	FairTrade
GATT	General Agreement on Tariffs and Trade
GCC	Great Council of Chiefs
GDP	Gross Domestic Product
GIS	Global Information System
GPS	Global Positioning System
IBM®	International Business Machines Corporation
IAASTD	International Assessment of Agricultural Knowledge, Science and Technology for Development
IDRC	International Development Research Centre
IKSA	Improvement of Key Services to Agriculture
ILO	International Labour Organization
ITC	International Trade Centre

ITK	Indigenous Technical Knowledge
*i*TLTB	*iTaukei* Land Trust Board
IUCN	International Union for Conservation of Nature
LCPA	Labasa Cane Producers Association
LDC	Least Developed Countries
LTA	Land Transport Authority
MACAC	Campesino-to-Campesino Agroecology Movement
MFS	Mixed Farming Systems
MoA	Ministry of Agriculture- Government of Fiji
MOGA	Memorandum of Gang Agreement
MoS	Ministry of Sugar- Government of Fiji
M.Sc.	Master of Science
MTEK	Marine Traditional Ecological Knowledge
NFP	National Federation Party
NGO	Non-Government Organization
NIR	Near Infrared
NLTA	Native Land Trust Act
NLTB	Native Land Trust Board
OECD	The Organization for Economic Cooperation and Development
PhD	Doctor of Philosophy
PICTA	The Pacific Island Countries Trade Agreement
PRA	Participative Rural Appraisal
PWD	Public Works Department
RFMF	Republic of Fiji Military Forces
RSD	Ratoon Stunting Disease
SAC	Sugar Advisory Council
SAG	Stakeholder Action Group
SAP	Sugar Industry Action Plan
SCGC	Sugar Cane Growers Council
SCGF	Sugar Cane Growers Fund
SLA	Service Level Agreement
SPS	Special Preferential Sugar
SPS	Sugar Protocol Signatories
SPSM	South Pacific Sugar Mills
SPC	Secretariat of the Pacific Community
SPSS	Statistical Package for Social Science software
SRIF	Sugar Research Institute of Fiji
TCTS	Tonnage Cane to Tonnage Sugar
TEK	Traditional Ecological Knowledge
TOT	Transfer of Technology
UCV	Unimproved Capital Value
UK	United Kingdom
UN	United Nations

UNEP	United Nations Environment Program
USA	United States of America
USDA	United States Department of Agriculture
VAT	Value Added Tax
WAF	Water Authority of Fiji
WD	Wheel Drive
WHO	World Health Organization

Chapter 1 Introduction

1.1 Introduction

This study investigates the current crisis facing the sugar industry in Fiji and the role of Indigenous Technical Knowledge (ITK) of smallholder sugarcane growers in finding a solution to it. The first section of this introduction provides a brief overview of the sugar industry in Fiji, its contribution to the development of the country, and the problems it is facing today. This leads to the main research questions guiding this study. Next, a description is given of the study location including a brief description of the sugarcane growing *Girmitiya* community. A brief introduction is then given to the background and motivation of the researcher, followed by a map of Fiji showing the fieldwork sites. The final sections outline the structure of the thesis and give a brief summary of the argument of the thesis.

1.2 Context of the Inquiry

The sugar industry has been the major strength of the Fijian economy for more than a century, displacing copra as the chief export in 1883 (Vaniqi: 2012). Beginning in 1882, by the mid-1970s, Fiji was exporting raw sugar to the United Kingdom (UK) and European Economic Community (EEC). In 1998, the sugar industry produced 364,000 tonnes of raw sugar, earning the country US$122.9 million, and generating 30 percent of Fiji's agricultural GDP (Advameg: 2016). However, this was a decrease in production from 437,921 tonnes in 1996, and by the new millennium tourism had taken over from sugar as Fiji's major export industry.

The relative contribution of the sugar industry to the Fijian economy has continued to decline in the 21st century. In 2002, sugar (including sugar manufacturing) contributed 7 percent of GDP (Prasad et al: 2011), bringing in 22 percent of total export earnings and 8.5 percent of total foreign exchange earnings, but by 2013, its contribution to GDP had declined to just 1.4 percent. The sugar industry remains vital, however, for the country's rural economy, in both the short and medium terms, with about 3,000 people working in the sugar mills, approximately 13000 active smallholder cane growers, and another 200,000 people directly or indirectly dependent on it for their livelihoods (FSC: 2007). Narayan and Prasad (2003, 17)

state that without the sugar industry the towns in the cane belts of Fiji 'would become ghost towns'.

The sugar industry is now beset by an increasing array of problems from both inside and outside the country. The UK, as part of the European Union (EU), was the biggest importer of raw sugar, and under Economic Partnership Agreements (EPA) was obliged to purchase sugar from Fiji tariff free. Recently, however, the EU has announced that their sugar market will be made competitive, resulting in the termination of preferential sugar access for Fiji in 2017. This will see Fiji, along with other African, Caribbean and Pacific (ACP) member countries, which have up to now been enjoying free quota access to the UK, having to compete globally for markets for their sugar produce. The issue has been worsened by the loss of over FJ$350 million in EU grants to the sugar industry over the 2006-2014 period as a response to the military coup in Fiji in December 2006.

Added to this is the pending expiry of some 20,000 native land leases in the sugarcane areas. Loss of faith in the sugar industry resulting from the non-renewal of land leases, coupled with increasing cultivation, harvesting, fertilizer and transportation costs, and decreasing profits from sugarcane production, have caused many farmers to voluntarily move out of sugarcane farming. Over the past twenty years, many growers have moved to urban centres in the quest for easier and better-paying jobs.

At present, most sugarcane farms are cultivated by the middle to late age-group of growers, with their children leaving to attend universities in order to qualify for higher paying jobs in the cities or overseas. Consequently, many growers of this middle-late age group are not passing on their farms on to the next generation.

Numerous policy frameworks have been developed to tackle these concerns and put in place measures to salvage the industry, but these have received little support from farmers. From the farmers' perspective, one of the many issues facing the sugarcane industry in Fiji today is the systematic exclusion of the cane farmers' voice from the industry. Despite their being major contributors to the industry in leasing and preparing the land for planting, growing and harvesting sugarcane, and transporting it to the mills for processing, and thereby making a major contribution to the rural development and GDP of the country, they feel that they have been neglected and

marginalized by the industry - something that they feel has not changed since the colonial era and the days of the Colonial Sugar Refinery (CSR) (1882 to 1973).

It has been predicted that, despite proposed reforms, the sugar industry may no longer exist by 2020 (McGregor: 2006). The major challenge then facing the smallholder cane farmers will be how to sustain themselves.

1.3 Research Questions

Based on the situation described above, this research aims to explore the role of the ITK of smallholder sugarcane growers in finding a solution to the crisis currently facing the sugar industry in Fiji. It does so by seeking answers to the following research questions:

1. What is the nature of the current crisis facing the sugar industry in Fiji and what are its causes?
    - What is the historical background to sugarcane industry in Fiji?
    - What contemporary situations have brought about the current crisis?
2. What solutions have been proposed for overcoming the current crisis?
3. What has been role of smallholder sugarcane growers in the development of the Fiji sugar industry and what is their current livelihood situation?
4. What ITK do smallholder sugarcane growers in Fiji have that might be used to help overcome the current sugar industry and rural livelihood crises?
5. What future agricultural paradigm – 'Industrial' or 'Agroecological' – offers the best possibilities for overcoming the current sugar industry and rural livelihood crises in Fiji in a sustainable way?
6. What institutional/policy changes would be necessary to help facilitate ITK based solutions?
7. What research methods are needed to help answer the above questions?

1.4 Study Location: The Fiji Islands

1.4.1 Topography

Fiji consists of a group of 330 islands in the South Pacific. The two main islands are volcanic, with rugged peaks, and flatland where rivers have formed deltas. The highest point is mount Tomanivi on the main island of Viti Levu with a peak of 4,340ft. Fiji's main river, the Rewa River, is also found on the main island and is navigable by small boats for 113km. The islands are surrounded by coral reefs.

1.4.2 Climate

Fiji enjoys a warm tropical climate perfect for beachside holidays, and this is a key reason for the country's reputation for being one of the World's most sought after holiday destinations. The temperatures in Fiji rarely move out of the 26˚C to 31˚C range all year round. The south-east trade winds blow from the east south-east for most of the year bringing in rain and light showers. The wet season peaks from November to April and is characterized by heavy, brief local showers and contributes most of Fiji's annual rainfall. The annual rainfall on the main islands ranges from 2000mm and 3000mm along the coasts and low-lying areas, and up to 6000mm in the mountains. The country is also subject to cyclones during the months of November to April when it experiences warm, wet, and often windy summer.

1.4.3 Sugarcane

Sugarcane is currently grown on the drier sides of the two main islands of Fiji, Viti Levu and Vanua Levu. Initially, it was grown on plantation estates owned by the Australian owned Colonial Sugar Refinery (CSR), but from the 1920s onward these plantations were developed into small holdings for the 10-acre tenant farm system which is still functioning today. The production of cane is almost entirely rain-fed, and yields are subject to wide annual fluctuations depending on weather conditions.

1.4.4 Trade

The country's exports of sugar, fish, crude coconut oil, root crops, and horticultural crops face international competition. Like its Pacific island neighbours, Fiji imports many of its basic food requirements. These include meat, milk, rice, the needs of the tourism sector, and around 90 percent of the food products in the supermarkets. The country is also highly dependent on imported oils. Given its isolation from the rest of the world, trade with other nations is limited except for Australasia.

1.4.5 Demography

The population of Fiji was estimated to be 895,825 people as of January 1st 2016. This was an increase of 0.73 percent (6,527 people) from 2015. Births exceeded deaths by 12,631 in 2015. The majority and indigenous *iTaukei*[1] population is predominantly Melanesian, with a Polynesian admixture. The country also has large populations of Fijians of Indian and Chinese descent, Rotumans, other Pacific Islanders, and Europeans. The official language of the country is English but *iTaukei* and Fiji Bāt are also used in normal conversations. The *iTaukei* dialects belong to the Malayo-Polynesian language group. The Bauan dialect is used throughout the archipelago except on the island of Rotuma, where Rotuman is spoken. Fiji Bāt, the local language of the Fijians of Indian descent developed over the years of *Girmit*[2]. About 52 percent of the population are Christians; 38 percent are Hindu; 8 percent are Muslim; and 2 percent follow other faiths. The new constitution of 2013 provides for freedom of religion, and the Government reportedly respects this right in practice.

1.5 The *Girmitiya* Community

The majority of Fijians of Indian descent are the descendants of indentured labourers brought to Fiji by the British to work on sugarcane plantations. Much academic attention has been given to the lives of the *Girmitiyas.* Many scholars; Charan (1970), Subramani (1979), Carswell (2000), Prasad (2004), Barbalich (2009), and Prakash (2009) have explored the history of the *Girmitiya* system and

[1] *iTaukei* denotes original settlers and native population of Fiji.

[2] The word *Girmit* is a corruption of the word 'agreement', i.e., the agreement under which people from India went to Fiji as indentured labourers.

documented the harsh condition of life under the British and Colonial Sugar Refinery (CSR) rule. Other authors, such as Ellis (1985; 1988), FSC (2003), Reddy (2003a), Mahadevan (2009), Kumari and Nakano (2016), Child (2016), and Singh (2018) have described the economics of cane production, and much has also been written on land tenure (Moynagh: 1978; Overton: 1994; Davies and Gallimore: 2000; Kurer: 2001; Lal et al: 2001, 97-102) and its implications for the sugar industry.

But there remains a wide opportunity to document the perceptions of the cane farmers of the industry, and the wisdom which this group has developed over the years in this industrial sector which is inherent to the *Girmit* community and the basis of their identity in Fiji and the world. Nor is there any published literature on the role of ITK in the sugar industry in Fiji, and its importance for sustainable production and farmer well-being. It is the aim of this thesis to fill this gap.

1.5.1 The Researcher: Background and Motivation

As a direct descendant of the *Girmit* community of Fiji, with nearly three decades of residence in the country, I share in many of the cultural values and ideals of the *Girmitiya* community, and my interest in carrying out this research was partly because of my self-identity as a *Girmitiya* and my wanting to expand my knowledge of that community. I am not, however, from sugarcane growing background. My family were fisher people, but in my work for the Fiji National University (FNU), I have had multiple interactions with sugarcane farming.

From 2011 to 2014, I was employed at the FNU Naviti Campus, in Lautoka, as a Lecturer and Training Officer in the disciplines of Environmental Management, Green Productivity, and Occupational Health & Safety. The job entailed travelling and teaching in different towns of the western and the northern regions of Fiji where sugarcane is cultivated, and my interest in the lives of sugarcane farmers was stimulated by my everyday observations of their farming activities and interactions with nature.

As a student at Jawaharlal Nehru University in New Delhi, India, from 2008 to 2010, I had studied the 'Traditional Ecological Knowledge' (TEK) of farmers in the state of Bihar, and I wanted to expand my understanding of farmer's knowledge by exploring the concept of Indigenous Technical Knowledge (ITK).

From news that the sugar industry was declining sharply, I began to wonder what would happen to the sugarcane growers should the industry collapse. This led me to think that I should explore the ITK of Fiji's sugarcane growers, with a view to whether it could have a role in solving the livelihood problem facing the *Girmitiya* sugarcane growing population, and perhaps even the problems facing the Fiji sugarcane industry as a whole.

1.6 Fieldwork Study Sites

The fieldwork of this research was carried out in the Western region of the main island of Viti Levu and the northern region of Vanua Levu, the second main island of Fiji (refer Figure 1.1). The regions are divided into four cane belts: Sigatoka-Nadi, Lautoka-Ba, Tavua-Rakiraki, and Labasa-Seaqaqa.

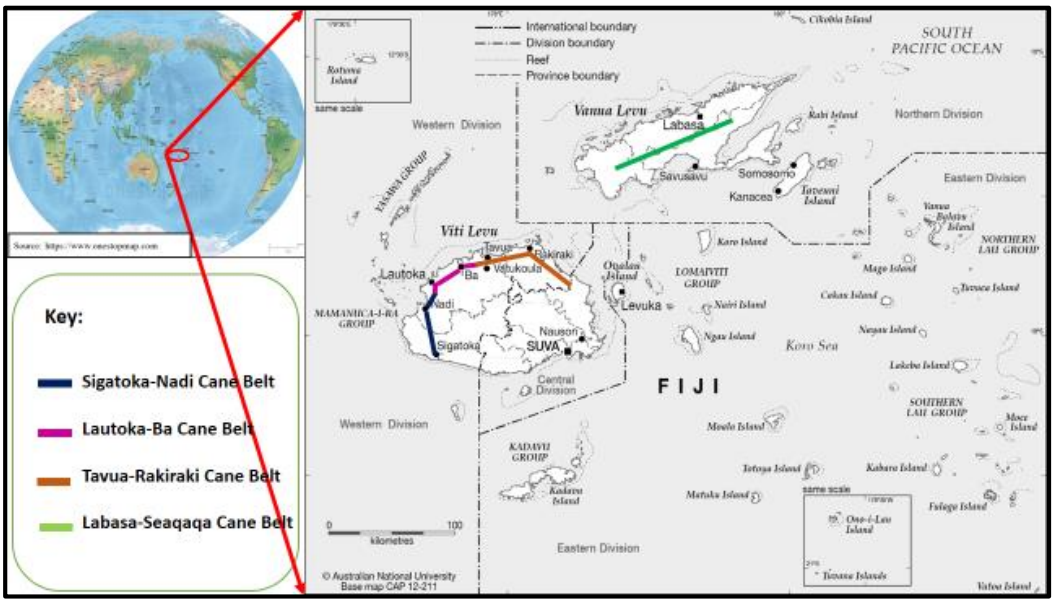

Figure 1.1: Case study area
Source: Australian National University

1.7 Structure of the Thesis

This thesis is divided into three parts. Each part consists of two or more chapters. A description of each chapter follows.

1.7.1 Part One: Research Background (Context of the Inquiry, Theoretical Framework, Methodology and Literature Review)

Following this Introduction, Chapter Two discusses the two prominent agricultural paradigms - the industrial agricultural paradigm and the agroecological paradigm –

commonly used in agricultural research. This chapter provides the theoretical framework for a constructive critique of the sugar industry in Fiji and the solutions and reforms proposed for it.

Chapter Three describes the methodological choices made in this research, designed to answer the research questions. This chapter discusses the Mixed Methods Research Methodology and the research instruments used in this research. It also presents information on the research population size, the sampling methods used for accessing research participants, a discussion of data processing and analysis, and a discussion of the researcher's position as an 'outside and inside' researcher.

Chapter Four presents an overview of sugarcane as a crop of global commercial significance. It provides details on some of the major sugar producers, importers and exporters, and the major international trade agreements and policies that have had an impact on the development and shaping of the sugar industry in Fiji.

Chapter Five provides an historical overview of the sugar industry in Fiji from the beginning of the indenture period in 1879 to 2015 as a background to the current problems facing the industry. It gives particular focus to the systematic exclusion of the cane farmers' voice from the industry.

1.7.2 Part Two: Research Findings

Chapter Six describes the situation of 29 cane farming households who participated in the livelihood survey, participant observation and the agroecosystem analysis phases of this research. It contributes towards the understanding of the social, human, agricultural, and cultural situation found within the current generation of the cane farming households in Fiji. It covers information on the situation of the cane farming communities in their struggle for continued sustenance in a modern developing Fiji. It also addresses differences between households of the four cane regions that were under study.

Chapter Seven documents the ITK of descendants of the *Girmitiya* community who are currently involved in sugarcane farming in Fiji. The findings presented represent the vast repositories of ITK in the sugar industry that has been

accumulated for over more than a century, since the beginning of indenture system in 1879.

Chapter Eight combines the results of research on both the main islands of Fiji where sugarcane is planted to identify the major challenges and constraints facing the industry and expounds on the differences in perceptions and interests that exist in the sugar industry between Government institutions, other institutional stakeholder, and sugarcane growers.

Chapter Nine describes the key measures proposed by relevant stakeholders in the sugar industry as solutions to the problems facing the industry. These include intensification, diversification, and mechanization of the agricultural production system, including the development of new market strategies for value-added products. It incorporates opinions and expressions of the farmers' viewpoint on existing solutions and their limitations.

Chapter Ten describes the structure of the sugar industry in Fiji; the different institutions and organisations involved in it and how they relate to each other. This is given as background to understanding their roles and responsibilities in light of the new sugar industry reforms and restructuring. It describes the proposed restructuring and reforming of the sugar industry in Fiji and discusses the farmer viewpoints in relation to these.

1.7.3 Part Three: Discussion, Conclusion and Recommendations

Chapter Eleven brings together evidence obtained from the existing literature with that obtained from the research findings and interprets these in the light of the research questions posed in Chapter One. It critically evaluates the evidence and outlines the implications of this for the future of the sugar industry in Fiji.

Chapter Twelve summarizes the main points of the argument developed in this thesis and presents an overview of its contributions. It also provides practical suggestions for changes in the current approach to reforming the sugar industry in Fiji arising from the research results and suggests promising avenues for further research.

1.8 Summary of the Thesis

This thesis analyses the current crisis facing the sugar industry in Fiji and its proposed solutions. It argues that present proposals for reforming the sugar industry are wedded to the industrial agricultural paradigm and a globalized corporate food regime that is the source of many of the problems it currently faces. It seeks to broaden the range of solutions by exploring alternative ideas and approaches suggested by the Agroecology paradigm. In particular, it focuses on the ITK of smallholder sugarcane growers as an important resource, not only for solving the livelihood crisis of smallholder cane farmers, but also that facing the sugar industry as a whole.

Chapter 2 Industrial Agriculture and Agroecology: Towards a Framework of Analysis

2.1 Introduction

In Fiji today, the sugar industry is a major source of livelihood for around 20 percent of the Fiji population. It is, however, facing major challenges to its sustainability. These challenges are *environmental* (environmental degradation, loss of biodiversity and soil fertility), *socio-political* (policy failures, and shortcomings in infrastructure and institutional arrangements), and *economic* (the loss of markets and unaffordable farm inputs). They are not specific to Fiji, nor to the sugar industry alone, but are being experienced in agriculture generally throughout the whole world.

Many people argue that these problems have their root in the industrial form of agriculture that has been dominant in the world since the end of the Second World War, and that their solution lies in the adoption of an alternative, more ecologically sound, and socially and economically just form of agriculture. In this chapter, two competing agricultural paradigms - the dominant conventional industrial model and the emerging alternative agroecological paradigm – are reviewed for what they can tell us about the causes and possible solutions to the problems faced by agriculture in the world today, and by the sugar industry in Fiji in particular. This is followed by a description of the framework of analysis developed for this research. The chapter concludes with a chapter summary.

2.2 The Industrial Model of Agriculture

2.2.1 Origins

It has been argued that the industrial model of agriculture had its origin with the plantation systems of America (North and South) (Mintz: 1985; 1960; 1978). In the 18th century, in European colonies in America, masses of labour (slaves imported from Africa) were assembled on large expanses of land for the large-scale cultivation of single crops (sugar, cotton, tobacco) for profitable export to Europe. Aspects of this model were later adopted by the rapidly expanding and increasingly technological economies of Europe, where small-scale, diverse farming began to

be replaced by large-scale agricultural estates specializing in the production of one or a few profitable crops (Perfecto and Vandermeer: 2009, 39-40).

In the late 19th and early 20th centuries, this American plantation model of agriculture was replicated in European colonies in Africa, Asia, and the Pacific, except that by now (as of 1834) slavery had been abolished in the British Empire. This forced the British to introduce a system of indentured labour whereby large numbers of colonial subjects were recruited to work on sugar and other plantations for specified periods of time. In Fiji, the system was based on five- year's indenture, during which time a labourer was bound to an estate manager. It was under this system many Indian indentured labourers migrated to Fiji and the Fiji sugar industry was established (D'Sousa: 2001, 1071).

2.2.2 Declining Soil Fertility

A central challenge faced by the new mono-crop system of agriculture was how to maintain soil fertility. In earlier systems, soil fertility was maintained by integrating crop production with livestock raising, and by utilizing crop rotations and long fallow periods. However, under the new system of capitalist mono-crop agriculture, crop rotations and fallow times were neglected or abandoned in order to maximize immediate profits. The result was that by the mid-18th century Europe was experiencing serious problems of declining soil fertility (Perfecto and Vandermeer: 2009, 41). A solution was sought in science, and by the mid-19th century, an incipient fertilizer industry had arisen, producing superphosphate through a simple chemical procedure, and importing phosphate rock, guano, sodium nitrate and potassium directly from natural sources (42).

2.2.3 The Fertilizer and Pesticide Industries

An important breakthrough for the fertilizer industry came in 1909-14 when two German scientists, Haber and Bosch, devised a method for extracting nitrogen from the atmosphere, and transforming it into ammonia on an industrial scale (ibid: 43). The process required extremely high temperatures and pressure produced by machines powered with fossil fuels. With this discovery, the fertilizer industry developed rapidly, as did the dependence of industrial agriculture on fossil fuels.

With the outbreak of World War One, a high demand for large quantities of nitrogen for nitrogen-based explosives led to a rapid expansion of chemical industries, and after the War, wartime levels of production were maintained by the dramatic expansion of industrial agriculture throughout Western Europe and North America. World War Two provided another impetus toward the chemicalisation of agriculture when governments became interested in the production of chemical poisons to combat insect pests affecting the health of their soldiers. The outcome was a high industrial capacity for the production of petroleum-based biocides and herbicides which after the war it sought to apply to agriculture (45). Also after the War, the industrialization of agriculture gained momentum with the promotion of its chemical-intensive systems of mono-crop agriculture in developing countries. By the late 1960s, industrial agriculture was the dominant mode of agriculture worldwide and had become accepted as 'conventional'.

2.3 Different Conceptualizations of Industrial Agriculture

Altieri (2007) uses the term 'industrial agricultural model' to denote the various scientific strategies, models, and approaches applied within the framework of conventional agriculture. This model has been conceptualized in various ways by various authors, in terms of 'the green revolution' (Altieri: 2009), 'transfer of technology' (Chambers: 1983; Warner: 2006, 84), 'corporate food regime' (Friedmann: 1995; McMichael: 2005), and 'contract agriculture' (Cid Aguayo and Latta: 2015, 400).

2.3.1 The Green Revolution

After World War Two, intensive systems of agriculture characterised by large-scale production of conventionally bred 'high yield varieties' grown for export were promoted in developing countries. This so-called 'green revolution' was built on the notion that the introduction of new high yield agricultural strains could combat the threats of global food insecurity resulting from rapidly increasing populations.

The "founding father of green revolution", Norman Borlaug (Mellor: 1966; Lionaes: 1972) saw it as a solution to the exploding demographics, especially in the third world countries, and as a remedy for nutritional deficiencies and distributional inequalities (Black: 1960; Brown: 1970). Others, have seen it as a way of

suppressing the political demand for rural land reform and as a way of providing a market for the excess production capacity of western chemical industries (Perfecto et al: 2009).

While the worldwide adoption of the green revolution technologies led to remarkable increases in agricultural productivity, this came at considerable social and environmental cost. The new high yield crop varieties require the application of large quantities of chemical fertilisers, pesticides, and herbicides to support their growth and high yields (Jarosz: 2012, 194), and during the 1960s-70s, the consumption of synthetic fertiliser worldwide increased by over 500 percent (Jarosz: 2012). Intensive mono-cropping in pursuit of economies of scale produced significant biodiversity loss and increased the susceptibility of crops to pest infestations due to increasing pesticide resistance and reduced habitat for natural pest enemies (Cid Aguayo and Latta: 2015, 399; Valenzuela: 2016, 4). The reorganisation of agriculture for mono-crop production resulted in economic problems for farmers faced with increased costs of fertiliser, fossil fuel inputs, and pesticides (Jarosz: 2012, 193-194).

Wright (2005) writes that small landholders and farm workers, specifically in the developing countries, have been the most affected by pesticide intoxication due to a lack of educational facilities and protection measures. In Fiji, for example, Szmedra (1999; 2001) found that a number of herbicides, such as Weedkiller E40 and E80, Diuron, Cane spray (2, 4-D+ Dicamba), among the other twenty or so herbicides commonly used by the farmers in the sugarcane regions are classified by the WHO as Toxicity Level II (moderately hazardous) or III (slightly hazardous), having the potential to cause carcinogenicity, injury to liver, heart, kidney, Parkinson's diseases, teratogenicity, and also to degrade the environment. The study concluded that although the average production of sugarcane was higher among pesticide users, the average annual medical expenditures were also significantly high, indicating that farmer's health was jeopardised in the process, and the usage of pesticides also affected farm productivity through lost days of work or diminished vigour.

2.3.2 Transfer of Technology

Closely related to the green revolution model of agriculture is the 'Transfer of Technology (TOT)' model that seeks to increase agricultural production in the developing regions by passing on technological advancements in agriculture made in the developed regions. For example, with cane farming, technology transfer aims to increase the sugarcane yield per hectare, and the amount of sugar in cane by producing new varieties with higher sucrose contents (Hunsigi: 2012, 191). Another example is the transfer of mechanised technologies such as the harvesters (Prasad: 2015b), tractors and threshers. Such transfers have enabled many of the large-holder, resource-rich sugarcane farmers in Fiji to increase their productivity and profitability. According to Chambers and Ghildyal (1985) however, the TOT model has a built-in bias that favour resource-rich farmers whose conditions resemble those of scientific research stations, nurseries and laboratories, and while it has been modified through on-farm trials and demonstrations, the basic model and approach remains the same.

The most common critique of agricultural technology transfer is that the agricultural technologies are not scale neutral but favour resource rich farmers at the expense of poor farmers (Valenzuela: 2016), and that the high input agricultural technologies such as heavy machinery, irrigation systems, and agrochemicals consume high amounts of fossil fuels, and the high costs of fossil fuels essential to industrial agriculture today have forced the displacement of poor farmers into slums and shanty towns (Tadaro: 1996).

2.3.3 The Corporate Food Regime

The corporate food regime model is grounded in the question of who organises the production of food, what, how and where food is produced, and by whom it is consumed. This model of agriculture describes the shifts in the locus of control over food security from the nation-state to corporate actors in the world markets who focus on food as a commodity only (Altieri 1987, xiv). In this model, transnational corporations, farmers, landholders, distributors, processors, retailers, policy-makers, and consumers are all identifiable groups whose actions affect each other's interests (McMichael: 2005), and it focuses on the structures, rules, procedures,

norms and values that encompass the interplay of social classes, lobbies, states, and capital.

McMichael (2005) recognises three different forms of food regimes: a colonial-forced food regime (1870-1930s); a post-war food regime (1947–1970); and a corporate-led food regime (commencing in the 1980s). In terms of these different categories of food regime, the sugar industry in Fiji under the rule of the British colonial government and the Colonial Sugar Refinery (CSR) Company of Australia was part of the 'colonial-forced food regime'. During the post-indenture period, the CSR continued to dictate the agenda and made rules for the sugarcane growers in Fiji, and the harsh conditions of this dictatorship are seared in the memories of the *Girmitiya* community (refer Ali: 1979; Moynagh: 1981; Lal: 1992; 1997; 2004; Prasad: 2004; Lal: 2011; Prasad: 2015a). Since 1972, despite state ownership, the industry has been largely corporate led.

Cid Aguayo and Latta (2015, 398) state that the 'corporate food regime' model relies on a perception of agricultural land, seen as a capital resource and food as a commodity. It is based on export-oriented mono-crop production that promotes the adoption of new technologies for increasing agricultural yields (Altieri: 2009) with little emphasis on their adverse effect on the overall farming system. This is true of the latest phase of the sugar industry in Fiji where the *Girmitiya* community, as a product of the colonial-forced food regime has been dictated to by the CSR's corporate focus on the mono-cropping of sugarcane for processing for export.

2.3.4 Contract Agriculture

Cid Aguayo and Latta (2015, 400) write that recent industrial agricultural models have reshaped the relations of production, causing many smallholder and peasant communities to lose control of the productive process and forcing them into contract agriculture as pseudo-proletarians on their own lands (Altieri: 2009; Jarosz: 2012).

Goodman et al (1987) describe contract agriculture as a parallel process of 'appropriation' and 'substitutionism'. Appropriation involves transforming agricultural cycles into agro-industrial processes, achieved through the replacement of localised agricultural knowledge, practices and inputs with scientific knowledge,

industrially derived materials, and globally standardised techniques (Goodman and Redcliff: 1991). Appropriation is complemented by 'substitutionism', the standardisation of the food as it moves through the value chain, converting agricultural outputs into industrial materials and eventually into durable goods (Cid Aguayo and Latta: 2015).

The combined processes of appropriation and subsitutionism requires the turning of small farms into mid to large-scale farms that are articulated with the agro-industry through contract agriculture, forcing the farmers to commit to the use of standardised inputs and procedures in exchange for purchase agreements. This approach has allowed corporations to download the risks of climate inconsistency, diseases, and pests onto farmers, who according to Cid Aguayo (2007) absorb these risks and often end up trapped in debts driven by the rising annual costs of industrial inputs. These processes are true of the Fijian sugar industry in its current period, whereby the proposed new reforms and restructuring of the industry aim at removing non-productive sugarcane growers from their farms and contracting the farms to newly trained entrants into the industry (The Sugar Industry Stakeholder Action Group: 2012, 34).

In summary, the industrialization of agriculture has involved four general processes: (i) more frequent use of the same area of land, (ii) increased specialization in the cultivation of a few profitable species, (iii) the substitution of inputs generated from on the farm, with inputs manufactured outside the farm and needing to be purchased (synthetic fertilizers substituted for compost and manure; chemical pesticides substituted for cultural and biological controls; and machines substituted for animal power), and (iv) increased processing, packaging, transportation, marketing and selling by large corporations once the product has left the farm (Davis and Langham: 1995). This form of agriculture has spawned many significant problems (Altieri et al: 2017).

2.4 The Industrial System in Crisis

While the accomplishments of industrial agricultural have been impressive in terms of productivity, these gains have been offset by negative consequences, such as inequitable access to and control of resources resulting in increasing inequalities

between rich and poor, and damage to human health and the biophysical environment.

If agriculture implies the simplification of nature's diversity by replacing it with a few cultivated plants (Altieri: 2003, 1), then this applies to industrial agriculture in the extreme. With its large-scale mono-crop plantations of uniform high yield crop varieties, industrial agriculture creates genetically homogeneous landscapes in which genetic diversity is severely eroded. This creates serious environmental problems. Biological diversity plays key ecological roles in pest control and nutrient cycling and their lack of biodiversity makes monocultures extremely vulnerable to pests and diseases (Third World Network: 2014, 1). To protect mono-crops from pest, copious amounts of pesticides are used, at considerable environmental and human cost (Altieri: 2003, 3). High yield industrial crop varieties also require the heavy applications of chemical fertilizer, leading to soil erosion, loss of soil fertility, depletion of nutrient reserves, salinization and alkalinization, and pollution of water systems (Altieri: 2003, 9). In addition to these environmental problems, industrial agriculture brings a variety of economic and social problems, including negative impacts on public health and food quality, the disruption of traditional rural livelihoods and accelerating indebtedness for thousands of farmers (Altieri: 2009, 102).

These environmental and socio-economic problems are not simply technological. They are deeply rooted in an economic and political system that promotes a rural development agenda dominated by a small group of multinational corporations that control what is to be produced, what technologies are to be used, what food consumers will eat, the quality and quantity of that food, and what price they will pay for it (Third World Network: 2014, 3). This is an agenda that is pursued in pursuit of profits at the expense of everything else, including consumers, farm workers, small family farms, wildlife, the environment, and rural communities (Altieri: 2003, 11). Meanwhile, the environmental and social costs of industrial agriculture - the chemical pollution, the greenhouse gas emissions, water contamination, loss of biodiversity, soil losses, and public health impacts - are treated as 'externalities' to be paid for by the public and future generations (Third World Network: 2014, 4). Heller and Keoleian (2003) write that central features of the industrial agricultural model have failed to meet key sustainability criteria; with

an increased dependence on high levels of agricultural inputs such as pesticides, chemicals, fertilisers, fossil fuels; adverse health impacts; loss of agrobiodiversity, and soil degradation; and a trend towards the consolidation of food industry which adversely affects the well-being of farmers, workers and consumers alike.

From a scientific research perspective, despite the significant achievements of agricultural science in increasing agricultural production, it has been less successful in attending to social and ecological consequences of technological achievements. This was the conclusion of the 2009 International Assessment of Agricultural Knowledge, Science and Technology (IAASTD) Report: *"Agriculture at the Crossroads"* (Beck et al: 2016). After six years of consultation involving more than 400 scientists from all continents, the World Bank and United Nations sponsored IAASTD concluded that, for industrial agriculture, "Business as usual is no longer an option" (IAASTD: 2009, 3), and came to the view that "A thorough and radical overhaul of present international and national agricultural policies is necessary to meet the enormous challenges of the 21st century" (Beck et al: 2016).

Of particular interest for the present research, is the IAASTD's call for wider recognition of "traditional and local knowledge and community-based innovations". It defines "traditional knowledge" as knowledge that is "constituted in the interaction of the material and non-material worlds embedded in place-based cultures and identities", and "local knowledge" as the "capabilities and activities that exist among rural actors in all parts of the world" (p71). Both forms of knowledge it says, "co-evolve with changes in their material and non-material environment" (p72), and constitute "a vast realm of accumulated practical knowledge". If development and sustainability goals are to be achieved, the report argues, decision makers cannot afford to overlook this "vast realm of accumulated practical knowledge" (p71).

The IAASTD report is only one of several recent international reports calling for a paradigm shift from industrial agriculture to more diversified agroecological systems (refer also UN Human Rights Council: 2010, a Report submitted by the Special Rapporteur on the right to food, Olivier De Schutter). Many other researchers and scientists, such as Hatt et al (2016), Altieri (2009), Gliessman and Rosemeyer (2010), Altieri and Toledo (2011), and Holt-Giménez and Altieri (2013)

are also strongly advocating a shift to 'Agroecology'. On these grounds, it is worthwhile pursuing what agroecology might have to offer by way of solution to the crisis facing smallholder sugarcane growers in Fiji.

2.5 The Agroecology Paradigm

In a recent review of Agroecology, Wezel et al (2009) write that the term is currently used to describe a science, a practice and a movement (p503). It emerged, they say, at the beginning of the 20th century to define the application of ecology to agriculture (p504). Then in the 1960s and 1970s, important influences were derived from research on traditional farming systems in tropical and subtropical countries. Since the beginning of the 1980s, agroecology has emerged as a distinct conceptual framework with holistic methods for the study of agroecosystems with the aim of contributing to the development of sustainability in agriculture, mainly at the level of the farming system. A second usage of the term is as a set of practices to help local farmers improve their indigenous farming practices as an alternative to adopting the high input, chemical-intensive agriculture promoted by international corporations (p506). Finally, as a movement, agroecology can be seen variously as a farmers' group working for food security, sovereignty, and autonomy; a political movement of the local population working for sustainable rural development; or as a farmers' group working through social partnerships to extend alternative modes of agriculture to better respond to ecological and environmental challenges currently being experienced in world agriculture (p511).

One of the leading academic authorities on Agroecology is the University of California Professor, Miguel Altieri (1989; 1995; 2002; 2009; 2011; 2012). In his first programmatic statement of the agroecology research agenda, Altieri defines agroecology as:

> a new scientific discipline for studying agricultural systems from an ecological and socio-economic perspective in order to delineate the ecological principles necessary for developing sustainable production systems by understanding more fully, in an integrated manner, the various factors that govern agricultural productivity (1989: 38).

Several key elements of the agroecology paradigm are present in this definition: (a) the conception of agricultural "systems"; (b) that need for them to be studied from a combined "ecological and socio-economic perspective"; (c) the idea that there are "ecological principles" that can be applied to develop, and (d) "sustainable production systems" and that they need to be understood (e) "more fully, in an integrated manner".

In 2002, Altieri expanded this definition of agroecology by including the concept of 'agroecosystems', which are defined as "communities of plants and animals with their physical and chemical environments that have been modified by people to produce food, fibre, fuel and other products for human consumption and processing" (Altieri: 2002, 8). In the light of this conception, agroecology can be defined as the holistic study of agroecosystems, emphasizing the inter-relatedness of all agroecosystems components, at both the ecological and social levels, in a complex of dynamic ecological processes (Altieri: 2002, 7).

At the heart of Agroecology is the idea that "an agroecosystem should mimic the functioning of local ecosystems" (Altieri: 2002, 8). This implies "the diversification of farms in order to promote beneficial biological interactions and synergies among the components of the agroecosystem so that these may allow for the regeneration of soil fertility and maintain productivity and crop protection" (Altieri and Toledo: 2011, 588). The key idea is that by taking advantage of natural processes and beneficial on-farm interactions, agroecosystems can be manipulated to improve production and to produce more sustainably, with fewer negative environmental or social impacts and fewer external inputs.

The "core principles of agroecology" are defined as: (a) recycling nutrients and energy on the farm, rather than introducing external inputs; (b) enhancing soil organic matter and soil biological activity; (c) diversifying plant species and genetic resources; (d) integrating crops and livestock, and (e) optimizing interactions and productivity of the total farming system (Altieri and Toledo: 2011, 588). On the last point, total farm production is considered more important to agroecology than single crop yield, and it is claimed that, if total output is considered rather than yield from a single crop, "small family farms are much more productive than large farms" and "integrated farming systems out-produce yield per unit of single crops such as corn mono-crops on large-scale farms" (Altieri: 2012, 4).

2.5.1 Transitioning Toward Agroecology

The aim of agroecology is not only to enhance existing sustainable forms of agriculture but also to assisting the transition of unsustainable industrial systems of agriculture to more sustainable ones (Wezel et al: 2014). This is to be achieved by (a) farm diversification, (b) better use of local resources, (c) human capital enhancement, (d) community empowerment through training and participatory methods, (e) access to local-regional markets, credit, seeds, and agroecological techniques, (f) exchange of ideas and innovations among farmers, and (g) soil conservation practices (Altieri: 2012, 6).

Clearly, such a transition would require major changes in existing policies, institutions, and research and development approaches (Altieri: 2009, 110; Dalgaard et al: 2003), as rather than relying on the transfer of technologies developed elsewhere (a key characteristic of industrial agriculture), the fundamental idea of agroecology is to allow farmers to select and confirm the validity of those processes that originate within their own social group (Altieri: 1989, 39). For this to occur there would need to be "a high level of popular participation, promoting farmers to become a strong political constituency capable of challenging the existing agricultural research and development agenda, and forging their own development path building upon traditional farming knowledge" (Altieri: 1989, 45). There are structural and political limitations, however, to these widespread changes. Existing policies, institutions and agendas are backed by powerful economic and institutional interests that support the conventional agro-industrial approach. Consequently, in most countries currently, at the policy level, and in most research institutes, agroecology and sustainable approaches are ostracized or largely ignored (Altieri: 2012, 12).

2.6 Different Agroecology Approaches

At different levels of scale, Agroecology takes on different analytical foci. At the scale of the plot or field, the research almost exclusively focuses on analysing crop-insect and crop-weed interaction with a particular emphasis on promoting natural processes of pest control, as well as highlighting the adverse impact of pesticides. At the farm scale, the farm is seen as an agroecosystem within a larger local or regional landscape (Wezel et al: 2009). The food system scale requires multi-scale

and transdisciplinary approaches and methods to study of food production systems, processing and marketing, economic and political decisions, and consumer habits in society (Wezel and Jauneau: 2011).

From the wide variety of interpretation and application of agroecology across the globe, Méndez et al (2013, 6) have identified two predominant perspectives: the first they say, "remains largely grounded in natural science research with a primary focus on analyses of the agricultural production process". It has "resulted in important findings on the biophysical and environmental aspects of agriculture" but "leaves social and cultural issues of the dominant agro-food system mostly unexamined". The second, "while developing from firm roots in the sciences of ecology and agronomy…engages with the social sciences and broader agro-food system issues". This latter perspective they say contains "transdisciplinary", "participatory action oriented", and "transformative" approaches.

2.6.1 Agroecology as a Transdisciplinary Approach

Transdisciplinary approaches are those that value and integrate different forms of knowledge systems (traditional, indigenous, technical/experimental, local, agrarian, etc.) and adopt a problem-based focus. This approach incorporates farmer generated knowledge. It goes further to incorporate cultural aspects. For instance, to incude in the management of agriculture rich symbolic and ritual systems that have historically served to regulate land use practices, and which are still relevant today (Mendez et al: 2013, 8).

2.6.2 Agroecology as a Participatory Action-oriented Approach

Participatory action research seeks to involve a diversity of stakeholders as active participants in a process of research, reflection and action, and seeks to provide voice to actors that have been traditionally excluded from the research process. In the last decade, an increasing number of studies have combined agrooecology with participatory approaches. These have involved farmers, community members, and partner organizations in the collaborative definition, implementation and interpretation of research, including different forms of knowledge and diverse aspirations in the design of research agendas and transition towards collectively defined goals (Mendez et al: 2013, 9-10).

2.6.3 Transformative Agroecology

A transformative agroecology approach incorporates a critique of the political economic structures that shapes the current agrarian food systems. This approach is committed to providing a more just and sustainable future by reorganizing and redistributing power relationships between different actors. The approach combines the critiques of rural development with political ecology, and emphasizes multi-scalar analysis to articulate local, social, and ecological phenomena with regional and global shortcomings that are a result of deepening capitalistic relations having turned people into labour and nature into a resource. With this approach, agroecology seeks to address asymmetrical power relations (Mendez et al: 2013, 11-12).

2.7 Agroecology's Relationships with other Disciplines

From the above, it is clear that Agroecology has close relationships with other disciplines, such as the 'farmer first' approach to development studies and anthropological studies of indigenous knowledge.

2.7.1 Development Studies

Within the field of development studies, many field researchers and development practitioners have concluded that agricultural technologies (for reasons discussed above) require substantial re-evaluation. One such re-evaluation has produced what has been called "the farmer first and last approach".

> "The basic philosophy upon which the model is based is that agricultural research and development must begin and end with the farmer. Applied agricultural research cannot begin in isolation out on the research station or with a planning committee out of touch with farm conditions … this means obtaining information about and understanding the farmers' perception of the problem, and acquiring farmers' evaluation of the solution" (Rhoades and Booth: 1982; Merrill-Sands and Collion: 1994).

The approach calls not only for attention to farmers' "extensive knowledge entomology, botany, soils, and agronomy" (p17-18), but also for much broader farmer participation in the design and implementation of rural development programs (Chambers: 1983; 1984). In developing these two ideas; (a) the

importance of indigenous or local knowledge, and (b) the need for farmer participation, agroecology has recognized the importance of the discipline of social anthropology.

2.7.2 Anthropology

Agroecology is described as a "highly knowledge-intensive" form of agriculture (Altieri and Toledo: 2011, 589) founded on "the systems that traditional farmers have developed and/or inherited throughout the centuries" (Altieri: 2002, 3). Such systems are said to exhibit several common features:

> (1) high levels of biodiversity that play key roles in regulating ecosystem functioning and also in providing ecosystem services of local and global significance; (2) ingenious systems and technologies of landscape, land and water resource management and conservation that can be used to improve management of agroecosystems; (3) diversified agricultural systems that contribute to local and national food and livelihood security; (4) agroecosystems that exhibit resilience and robustness in coping with disturbances and change (human and environmental), minimizing risk in the midst of variability; (5) agroecosystems nurtured by traditional knowledge systems and farmer innovations and technologies; and (6) socio-cultural institutions regulated by strong cultural values and collective forms of social organization including normative arrangements for resource access and benefit sharing, value systems, rituals, etc. (Altieri and Toledo: 2011, 591).

These traditional systems of agricultural practice and technology, knowledge, and the socio-cultural institutions that regulate them also constitute a primary field of anthropological research.

2.7.2.1 Traditional or Indigenous Knowledge

Indigenous knowledge has long been a subject of anthropological research, where it has been defined as:

> any knowledge held more or less collectively by a population, informing understanding of the world. It may pertain to any domain … is community based, [and] embedded in and conditioned by local tradition. It is culturally

> informed understanding inculcated into individuals from birth onwards … [but] also informed continually by outside intelligence. Its distribution is fragmentary … no one person, authority or social group knows it all … It exists nowhere as a totality, there is no grand repository, and hence no coherent overall theoretical model … It is equally skill as conscious knowledge … [and is] transmitted orally and through experiences, and repetitive practice characterizes its learning between generations. It is the heritage of practical everyday life, with its functional demands, and is fluid and constantly changing, being dynamic and subject to ongoing local, regional and global negotiations between people and their environment (Sillitoe: 2002, 9).

This definition equates "indigenous knowledge" with anthropological cultural research generally. In the field of development studies, the object of 'indigenous knowledge research' is applied to introduce a locally informed perspective into agricultural development (ibid).

This can be traced back to the 1980s to a collection of papers in the *IDS Bulletin* in 1979 by Howes (1979), Howes and Chambers (1979), and Richards (1979); the work of Brokensha et al (1980); Richards (1985), and, later, Warren (1991) promoting the concept of 'development from below'. As Brokensha et al (1980) put it:

> 'Development from below' is for many reasons, a more productive approach that from above, and … an essential ingredient [in this approach] is indigenous knowledge … To incorporate in developmental planning indigenous knowledge … makes possible the adaptation of technology to local needs … encourages community self-diagnosis and heightens awareness; [allows the use of] local skills in monitoring and early warning systems; [and] involves the use of feedback systems, for example, on crop varieties (Brokensha et al: 1980, 7-8).

In the same vein, Robert Chambers, at the Institute of Development Studies in the University of Sussex, initiated a call for a 'reversal' of conventional development practice by 'putting the last first', empowering the 'hitherto excluded', and putting farmers themselves centre stage in the planning and execution of development

projects (Chambers: 1985; 2005; 2014), all of which was underpinned by an appreciation of the importance of understanding the knowledge systems and values of the local people (Flavier et al: 1995, 501). Warren, in a paper prepared for the World Bank, defined Indigenous knowledge as

> local knowledge – knowledge that is unique to a given culture or society.…the basis for local-level decision-making in agriculture, health care, food preparation, education, natural resource management, and a host of other activities in rural communities. Such knowledge is passed down from generation to generation, in many societies by word of mouth. Indigenous knowledge has value not only for the culture in which it evolves, but also for scientists and planners to improve conditions in rural localities (Warren: 1991, 1).

This new focus among development planners on indigenous knowledge represented a major shift from the preoccupation of the past with centralized, technically oriented solutions (Agrawal: 1995, 414). In the 1950s and 1960s, theorists of development saw indigenous and traditional knowledge as inefficient, inferior, and an obstacle to development (Agrawal: 1995, 414), but by the end of the 1990s, the deployment of indigenous knowledge was part of the armoury of mainstream development agencies (Briggs: 2005, 100).

> The problems of rural development were no longer seen to reside in the 'traditional' cultures of under-developed people, but rather in the partial and biased understandings that have emanated from the un-reflexive application of western scientific rationality … Indeed 'traditional' cultures are now seen as containing the bases for any effective development (Titilola et al: 1995, 499).

It is now widely accepted that in order to be effective, scientific knowledge needs to be incorporated into indigenous knowledge (Sillitoe: 2000, 3; DeWalt: 1994, 128).

> The assumption that experts, notably economists, can diagnose problems and devise plans for government to implement to improve people's lives is questioned. Agencies now accept that they need to consult more closely with their target beneficiaries, that is involve them in problem

identification and decision-making processes, rather than trying to impose outsider-devised interventions on them (Sillitoe: 2000: 3).

It is now recognized that local people are well qualified to define their own problems, and are experts on their soils, crops and pests, and that in order to be effective, the results of scientific research need to be incorporated into indigenous knowledge systems. A first important step is discovering the local peoples' knowledge of problems and solutions. Social scientists, especially anthropologists as "liminal personae" (Turner: 1969, 95) coming from the society and culture of scientists, but often identifying with or focusing on the needs and goals of those they study (DeWalt: 1994, 128), are especially equipped for this role. The key is to provide both systems of knowledge, scientific and indigenous, with more opportunities in which they can inform and stimulate one another.

2.8 Framework of Analysis

The approach taken in this study take note of the two prominent characteristics of agroecology described by Mendez et al (2013): (i) "while developing from firm roots in the science of ecology and agronomy", and (ii) "[agroecology] engages with the social sciences".

2.8.1 Ecology and Agronomy

In the first instance, the study looks into traditional forms of nutrient and energy recycling taking place on the sugarcane field of Fiji, the enhancing of soil organic matter and biological activity using traditional methods, the diversification of plant species and genetic resource in the cane fields and on the peripheries of the fields, both in time and space, the integrating of crops and livestock in the fields for overall optimization of the total farming systems for enhanced productivity using traditional knowledge systems, and argues that sustainability and resilience of the sugarcane fields may be achieved through diverse and complex farming systems. Such a diverse and complex agricultural systems may hold many of the potential answers to the many problems facing the sugar industry today.

It is important to note that in present day Fijian agriculture, locally modified relics of earlier agronomic forms are still present, and locally developed agricultural systems in Fiji continue to take advantage of the surrounding available renewable

inputs, ecological and structural features of the agricultural fields, fallows, and the surrounding vegetation. In this way, the local farmers are not only managing a particular crop of importance but are also managing the overall resources. This is based on local sugarcane smallholders across the whole sugarcane region routinely incorporating mechanisms that accommodate their crops to the variability of the natural environment and provides protection from predation and competition from pests and diseases.

2.8.2 Social Science

Secondly, this thesis engages with the social sciences in its focus on the *Grimit* community of smallholder sugarcane growers, their local knowledge and customary practices, and participatory research methodologies, social institutional analysis, and critique of rural development policies.

2.8.2.1 The *Girmit* Community

Historically, agroecology has focused mainly on traditional agrarian peasant societies. The present case is different. With Fiji sugarcane growers, we are dealing not with a traditional peasant society, but with the descendants of migratory individuals forced to work on industrialised sugarcane farms in a space with which they had no prior knowledge or connection. The agricultural reforms and changes within this community since 1879 have been shaped by colonial and industrial rules. However, within this context, the *Girmit* community has developed a rich set of values and a deep history. Over a century of social transformation, they have built their knowledge systems through trial and error methods in their farming practices in order to become efficient and effective farmers. This has made a cane farming culture unique to Fiji and the world, and their knowledge worthy of inclusion in the wider discourses on sugarcane industry development in the country.

2.8.2.2 Indigenous Technical Knowledge

In this study, the term 'Indigenous Technical Knowledge' has been used to refer to the agricultural knowledge of Fiji's *Girmitiya* sugarcane farmers. Although this population is not indigenous to Fiji, they are indigenous to the sugarcane farming in the country, and as such, are the holders of a vast amount of traditional agricultural knowledge accumulated through trial and error methods since the

introduction of the sugarcane plantation system in Fiji, and through their immersion in the island culture over many generations. Vandermeer and Perfecto (2012) write that agroecology builds on the local knowledge and skills of the farmers and their local organisations that develop, conserve, and manage localised food productions and harvesting systems, developing localised appropriate research systems to support this and passing the wisdom to the future generations. The present study seeks to document the ITK of the sugarcane farmers in Fiji, something that has not been done before.

2.8.2.3 Participatory Research

The characteristic research method in anthropology is 'participant observation', i.e., the long-term physical and emotional involvement in the everyday lives of the people being studied. It involves living with the people that they are interested in understanding, observing, and learning about them first-hand by participating in their daily activities, although it may also use conventional research techniques as informal interviews, surveys and focus group discussions. Participatory research advocated by 'farmer first' development approach refers to the direct involvement of farmer participants in the research process. The participants are positioned as active researchers, and the aim is to empower them as owners of their own knowledge in an equal exchange with outside 'experts'. The purpose is both to inform the design of development projects and develop the skills and organizational means that the people need to participate in policy decisions arising from the research (Wright and Nelson: 1995, 57-58). While utilizing 'participant observation' research, this thesis does not extend to 'participatory research' in the sense of involving farmer and other subjects in the research design process. There is, however, a third meaning of 'participation'. This involves all stakeholders having a voice in the research findings. With this in mind, this study has endeavoured to include all the major stakeholders in the sugar industry.

2.8.2.4 Institutional and Actor Analysis

The Fiji sugar industry is a complex structure made up of many different organizations and institutional actors representing the interests of the state, growers, landowners, investors and customers, all of whom have played formative historically and decisive contemporary roles in the industry's development. The

analysis of these major actors and their often-conflicting agendas, roles and responsibilities is essential not only for understanding the industry as a whole but also in assessing the structural and political limitations to the types of changes envisaged by an agroecological approach.

2.8.2.5 Critique of Rural Development Policies

Recent decades have seen calls for the industrialisation of the agricultural systems in Fiji, in particular in the declining sugar industry. Certain farming communities, however, in particular the sugarcane farming community, continue to resist these calls. The farmer research participants in the current study continue to exhibit resistance to the industrialisation of the sugar industry. This is because their rural economies have sustained and adapted a set of socio-spatial practices over the many generations in close connection with the ecology of their farms. In this context, the proposed intensification in the industrialisation of the sugarcane industry in Fiji raises serious concerns about the vulnerability and loss of *Girmit* identity, history, culture, sugarcane farming knowledge, as well as other socio-economic problems. From anthropology, the study has adopted a holistic focus on social and cultural as well as economic factors in its critique of these policies.

2.9 Chapter Summary

In this chapter, two competing agricultural paradigms were reviewed; (i) the dominant conventional industrial model, and (ii) the emerging alternative agroecological paradigm. Both paradigms were considered for what they can tell us about the causes and possible solutions to the problems faced by agriculture globally, and more specifically by the sugar industry in Fiji. The relationship between agroecology, development studies, anthropology and traditional or indigenous knowledge was then explored as a basis for a framework of analysis combining insights from Ecology, Agronomy and Social Sciences.

Chapter 3 A Mixed Methodology

3.1 Introduction

The 2009 International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) Report (refer Section 2.4), adopted a view of agriculture "as a multi-output activity, producing not only commodities but also non-commodity outputs such as environmental services, landscape amenities and cultural heritages" (p.18). It states, however, that historically, agricultural sciences have focused solely on delivering component technologies aimed at increasing farm-level productivity. "Formal Agricultural Knowledge, Science and Technology (AKST)", the Report says, "has typically focused on increasing specialization of commodity production … on mainstream, input-intensive, irrigated mono-cropping systems … based on a linear top-down flow of technologies and information from scientific research to adopters" (p.25). It argues that, given the new challenges confronting agriculture today, revision of this model is required.

In particular, the report argues for formal AKST "to be informed by knowledge about farmers' conditions, opportunities and needs, and by participatory methodologies that can empower small-scale producers" (p72). Formal AKST systems, it says, "require the revalorization of traditional and local knowledge and an interdisciplinary (social, biophysical, political and legal), holistic and system-based approach to knowledge production and sharing" (p17). To achieve this, it says, "improvements are needed in engaging farmers in priority setting … in increasing collaboration with social sciences, and increasing participatory work in core research institutions", and this calls for "multidisciplinary programs, cross-disciplinary learning and scientific validation, involving both research and non-research actors, and recognizing the cultural identity of indigenous communities" (p31).

This chapter describes the methodological choices made in this research, designed to meet, as far as possible, the need for the new model of agricultural research called for by the IAASTD. To deal with the stated multifunctional nature of agriculture, and the need for cross-disciplinary learning, a Mixed Methods Research Methodology was chosen.

In the following section, the Mixed Methods Research Methodology and the research instruments used in this present research will be discussed. This is followed by a discussion of the population size and sampling methods used for accessing research participants and a discussion of data processing and analysis. The final section discusses the researcher's position as an 'outside and inside' researcher. The chapter closes with a brief summary.

3.2 A Mixed Methods Research Methodology

Bryman (2001: 20) states that researchers must devise a strategy (Qualitative, Quantitative, or Mixed Methods Research) to address their research question or set of research questions. The research questions addressed in this thesis are set out in Chapter One, and were seen as requiring a Mixed Methods Research strategy. Mixed Methods Research is a third major research paradigm alongside Qualitative and Quantitative Studies (Onwuegbuzie et al: 2010; Johnson et al: 2007, 112). Onwuegbuzie (2011), Johnson and Onwuegbuzie (2004), and Collins et al (2006) define mixed methods research as the mix[ing] or combin[ing] of quantitative and qualitative research techniques, methods, approaches, and concepts or language into a single study.

Mixed methods research has been referred to variously as 'triangulation' (Turner and Turner: 2008; Jick: 1979), 'multiple operationalism' (Johnson et al: 2007; Campbell and Fiske: 1959), 'ethnographic residual analysis' (Fry et al: 1981), 'blended research' (Thomas: 2003), 'multimethod research' (Morse: 2003), 'triangulated studies' (Sandelowski: 2003), 'integrative research' (Johnson and Onwuegbuzie: 2004), 'multiple methods' (Smith: 2006), and 'mixed research' (Johnson and Christensen: 2004; Johnson: 2006). Brannen (2005) claims that there has been a surge of interest in mixed method research in recent years.

Wisdom and Creswell (2013) refer to mixed methods research as an emergent research methodology that advances the systematic integration, or "mixing" of quantitative and qualitative data within a single investigation or sustained program of inquiry. According to Wisdom and Creswell (2013) and Creswell and Plano Clark (2007), the basic premise of this methodology is that such integration permits a more complete and synergistic utilization of data than does separate quantitative and qualitative data collection and analysis.

Mixed methods methodology has been seen as having a number of benefits (Creswell: 2014; 2003; Creswell and Plano Clark: 2007; Brannen: 2007; 2009; Greene: 2007; 2006; 2005):

1. Comparing quantitative and qualitative data can help resolve problems of inconsistency of finding with a single (qualitative or quantitative) data set (Creswell and Plano Clark: 2011; 2007; Tashakkori and Creswell: 2003);
2. Mixed methods allow the research findings grounded in participants' experiences to be validated using numerical measurements, thus strengthening the participants' voice (Toomela: 2008);
3. Mixed Methods Research encourages the interaction of qualitative, quantitative and mixed method scholars (McKim: 2017; Schulze: 2003);
4. Mixed methods research has greater flexibility and is adaptable to many study designs, such as observational studies and randomized trials where it helps elucidate more information than would solely quantitative research (Morse and Chung: 2003; Teddlie and Johnson: 2009);
5. Mixed methods, by integrating quantitative and qualitative data, enhance findings by mirroring the way individuals naturally collect information (Bryman: 2006). Greene (2008) states that mixed methods provides multiple views and standpoints (cited in Botha: 2011, 323).

On the other hand, there are several limitations to mixed methods research. These have been identified by Wisdom and Creswell (2013) and Teddlie and Tashakkori (2010) as:

1. Increasing the complexity of the research design: mixed methods research is relatively more complex to plan and conduct than single methodology research;
2. Relying on a multidisciplinary team of researchers: the researchers need to be open to methods that may not be in their areas of expertise. Since each individual method must adhere to its own standards for rigour, ensuring appropriate quality of each component of a mixed methods research can be difficult (Onwuegbuzie: 2011);

3. Requiring increased resources: mixed methods research is labour-intensive and requires greater resources and time then those needed to conduct a single method study (Tashakkori and Teddlie: 2003; 1998).

It is claimed by Creswell (2015), and Teddlie and Tashakkori (2009) that mixed methods research is only 20-30 years old. Pelto (2015) however argues that mixed methods research has been used in sociological and anthropological research for at least 80 years, citing "Ethnographic studies concerning Culture and Personality" (Powdermaker: 1956; Spindler and Spindler: 1958; DuBois: 1961), "Economic and Ecological Studies" (Redfield and Rojas: 1962; Bennet: 1967; Knight: 1974), and "Medical and Health Care Research" (Oberesekere: 1998; Montgomery: 1998).

Johnson et al (2007) credit Campbell and Fiske (Campbell and Fiske: 1959) as being the first to formalize the use of mixed methods research and to also explicitly show how to use multiple research methods for validation of data.

According to Brannen (2005) and Onwuegbuzie (2011), mixed methods research may (a) constitute a strategy in its own right, or (b) be subsumed with another research strategy. The present research adopts the first strategy following Johnson and Onwuegbuzie (2004: 17). The latter state that the research question is central to research, and from a pragmatic point of view that the maxim for mixed methods research is to choose the combination or mixture of methods and procedures that works best for answering the research question. Accordingly, this research combines qualitative and quantitative methods depending on which best serves to answer the research questions posed in Chapter One (refer Section 1.3).

An alternative, 'interactive perspective', has been argued for by Mertens et al (2016) who state that "research questions shape and are shaped by methods" (p11). This interactive approach is viewed as making it possible "to explore new ways of doing things to answer questions that become visible and approachable through the use of mixed methods" (p6). They draw on Maxwell and Loomis (2003), who propose a dynamic research design model whereby research questions influence and are influenced by conceptual frameworks, purposes, methods and validity criteria. This 'interactive approach' was not adopted in this research. Instead, the choice of methods was driven by what was thought most effective for answering the research questions as initially posed.

Mixed methods research is common in agrosystems research. For example, Hoffmann et al (2001, 264-267) used a variety of qualitative and quantitative research techniques to describe indigenous systems of soil fertility management in the Zamafara Forest Reserve of Northwest Nigeria. In another example, Perera et al (2003, 122-128) used qualitative techniques to investigate the reasons for low sugarcane and sugar yields in Sri Lanka. In both cases, they converted their qualitative results into numerical data to derive statistical conclusions relating to farmers' perceptions of extension communications, knowledge of farming practices, adoption of farming practices, and the factors affecting them.

Mixed methodology research has also been used in agricultural research in selected regions of Pakistan and China to evaluate the adoption or non-adoption of sustainable agricultural practices among the smallholders. Here it was found helpful in reviewing hypotheses, provided assistance in designing questionnaires, and in the planning of survey operations (Sattar et al: 2017).

Sattar and his colleagues suggests that mixed methods researchers should consider using various mixed methods in a single study that can help illuminate information for discussion on topics such as sustainable agricultural practices, farmer's behaviour, financial factors, social factors, climatic factors, farmer's perceptions, beliefs, attitudes, and barriers to adoption and non-adoption of sustainable agricultural practices. For instance, literature review, focus group, and problem ranking Participative Rural Appraisal (PRA) exercise for Sattar and his colleagues all helped reveal problems faced by the farmers. The use of questionnaires, farmer interviews and fieldwork observations generated information on farmer livelihoods, and interviews with Governmental agricultural officers and NGO staff helped document sustainable agricultural practices and traditional farming practices. In addition, reasons for the adoption and non-adoption of sustainable practices were captured through questionnaires, farmer interviews and informal discussions with farmers and key informants. The authors also state that information on environmental parameters such as rainfall and temperature could be gained from the local Government meteorology departments while illustrations on maps generated through transect walks of the farms could be made more meaningful by using technology such as Global Positioning System (GPS) and Global Information System (GIS).

Given the advantages of mixed methodology utilized in the research, the authors argue that mixed methodology can be extended to other agricultural investigations such as of climate change adaptation, program participation, and responses to agricultural policies.

3.3 Fieldwork

Soon after I arrived back in Fiji in December 2014 to conduct fieldwork, I traveled to the western sugarcane belts of Viti Levu (and later of Vanua Levu), and met my contacts and network members who helped me identify potential sugarcane farmer hosts and farm sites where I could carry out the ethnographic aspects of this research.

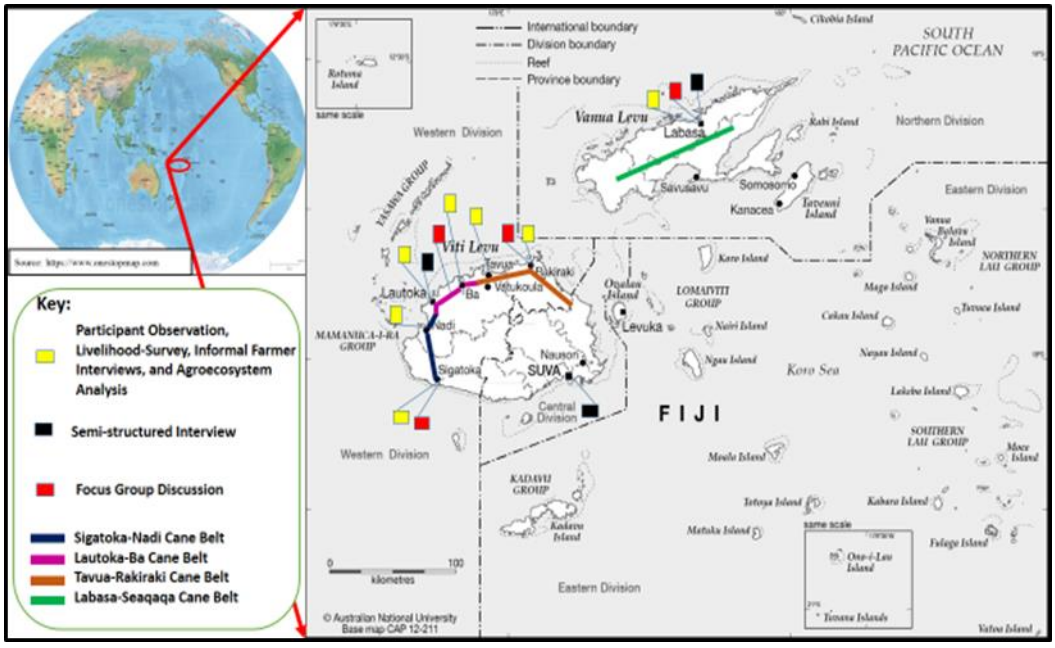

Figure 3.1: Field sites and research methods

Figure 3.1 above illustrates the location of the different cane belts and where the different types of research instruments were used: (a) participant observation, livelihood surveys, informal farmer interviews, and agroecosystem analysis; (b) semi-structured interviews; and (c) focus groups discussions. Semi-structured interviews were held with representative of institutional industry stakeholders selected by those institutions.

3.4 Research Method

The qualitative aspects of the research were designed to elicit data on smallholder sugarcane farmers views, feelings, thoughts, and opinions on the Fiji sugar industry, their relationships with other sugar industry actors, and their own Indigenous Technical Knowledge (ITK) of sugarcane farming. They were aimed at facilitating farmer participants to describe their own experiences and perceptions in their own terms. The methods used were participant observation, focus group discussions, informal interviews with sugarcane farmers, and semi-structured interviews with other industry stakeholders. The methods also included historical documents/literature survey and analysis for wider information gathering. These methods were framed within an overall research strategy aimed to produce as realistic a picture as possible of the crisis facing the sugar industry in Fiji and the role that the ITK of smallholder sugarcane farmers might have in formulating solutions to it.

The quantitative aspects of the research were designed to capture information on the household and farm status of the research participants and to support the data captured through the qualitative aspect of the research. The quantitative aspects involved the collection of data on the standards of living of the farmers and information of their farms, sugar production trends/forecasts of FSC, and analysing it to understand variables that can lead to increased sugarcane production.

The quantitative research instruments consisted of a livelihood survey and agroecosystem analysis of farmer participants and their farms. Information captured in this way was converted into numerical values using Microsoft® Office Excel Spreadsheet and IBM® Statistical Package for Social Science software (SPSS) and analysed to provide an up-to-date profile of livelihood and farming situation of smallholder sugarcane growers.

Figure 3.2 below illustrates the different research instruments and the factors they were designed to elicit.

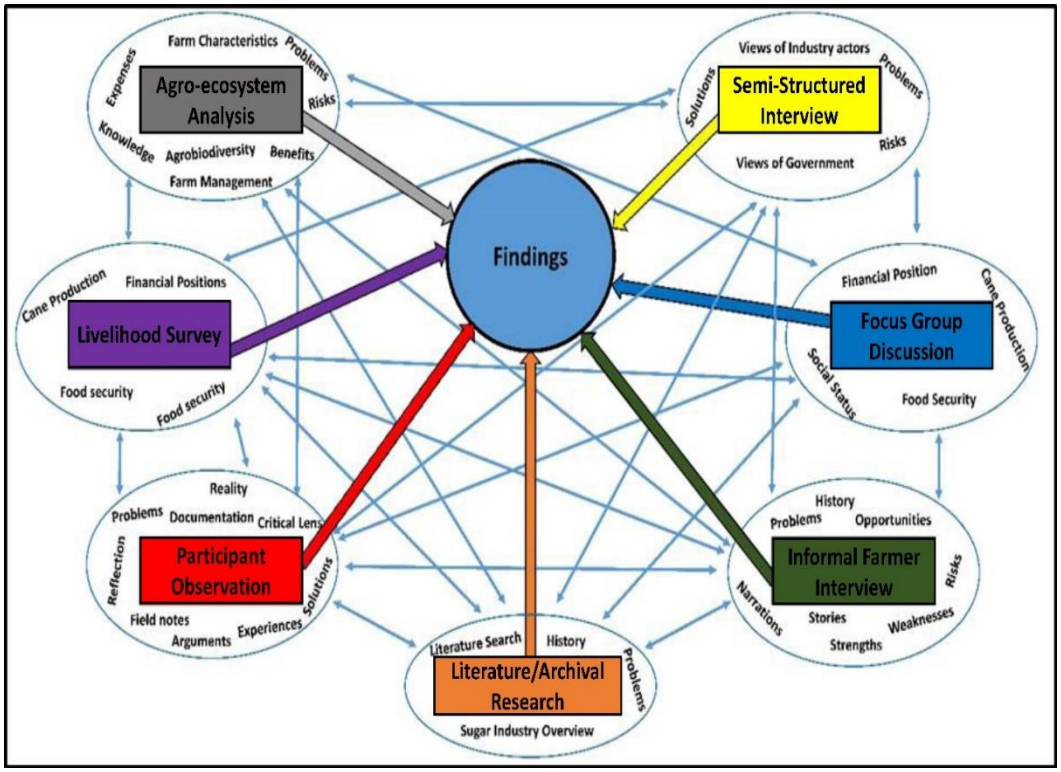

Figure 3.2: Factors determining the different research instruments applied during the investigation

3.4.1 Literature/Archival Research

According to Knoblauch (2005) some prior knowledge of the field is necessary before venturing into fieldwork. Accordingly, archival data was sourced to obtain background information on the sugarcane growers and sugar industry, to review past efforts in Fiji to develop solutions to the problems that smallholder sugarcane farmers have historically been faced with, and what solutions have been implemented at local and national levels. Information was also obtained on the different varieties of agrobiodiversity, cropping techniques and methods of farming that the smallholder sugarcane farmers have been historically engaged in. Archival data was also sought on sugarcane production trends and the various industry stakeholders.

For the contemporary situation of smallholder sugarcane farming systems, the investigation draws on Hoffman et al (2001), Naidu and Reddy (2002), Valbuena et al (2012), Kamau et al (2014), Megersa et al (2014) and Thierfelder (2015), and builds on it by using a combination of agronomical and social anthropological

approaches inspired by leading scientists and academics in the field of agroecology, such as Altieri. M: (1987; 1995; 1999), Altieri et al: (1998; 2015), Wood. D: (Wood and Lenne´: 1997), Gliessman. S: (2007; 2014), Gliessman and Rosemeyer: (2010), Ernesto, V. Méndez: (Méndez et al: 2013), and Randy, R. Thaman: (Thaman: 2014).

Literature and Archival research contributed to specifically answering research question number 1.

3.4.2 Participant Observation

For a detailed understanding of contemporary smallholder sugarcane farming life, the anthropological fieldwork method of 'participant observation' was used. Eriksen and Nielsen (2001) write that in order to achieve a greater understanding of the experiences of a research population, it is vital to be trained by the local communities through participating to varying degrees in their daily activities. In the present case, this meant residing temporarily with selected sugarcane growers to learn their worldviews and belief systems, and the day-to-day context of their agronomic discourses and attitudes towards their natural environment. Data obtained in this way allowed the formation of an in-depth understanding of the smallholder sugarcane farmer way of life, drawn from the actual lived experiences of the growers.

Cole (2004) states that long-term engagement with local communities permits the researcher to gain a basic understanding of the local peoples' daily lives, which in turn provides a platform for gaining the trust of those whose lives, perceptions, and attitudes we as researchers are aiming to understand. In the present case, this involved mastering the local sugarcane farming language and spending most evenings and nights sitting with the host family heads, and at times with the entire farmer family, engaged in informal conversations about sugarcane farming and ongoing farming issues, and listening to timeworn stories and histories of their lives harking back to the turmoil of the *Girmit* system under the CSR and British rule and later FSC rule. The recording of such narratives became an important aspect of the study, as did my own reflections upon them.

> As my hours of staying with my farmer hosts are turning into days, and days turning into months, my participants are starting to open up slowly and their trust and confidence in me is growing. They are happy to provide me with confidential information and tell me their personal stories. Many of them are seeking my recommendations and suggestions for overcoming the problems that they are faced with. Most of them even went a step further to provide me with their original legal documents of sugarcane harvests, land tenancy agreements, papers concerning payments, minutes of gang meetings, copies of letters to the different personal holding authority and power in different sectors and offices of the Fijian Government and also the Statutory Authorities in the country (Diary Entry: 2015).

As a *Girmit* descendant myself, and having been raised with Muslim values, I often became a confidant of my Muslim sugarcane farmer hosts, who shared with me their opinions and life stories, fears, hopes, and dreams. Non-Muslim hosts shared with me their stories as well. My Muslim identity was never a barrier, and in some circumstances it made access to the field easier.

> I am curious to know how the current descendants of the indentured labourers carry on the legacy of sugarcane farming in the hope of securing brighter and better sustainable livelihoods for themselves, their children and grandchildren. It is disheartening to listen to their histories, stories, and experiences. While being a *Girmitiya* myself, my family were detached from sugarcane farming when the industry shifted from the central/eastern region of the main island of Viti Levu to the western region and the island of Vanua Levu. Therefore, we do not have the painful history of these sugarcane growers as my ancestors took up other livelihood options, venturing into trade and fishing. This means, to some degree, that my ancestors did not experience the harsh treatments that the ancestors of these sugarcane farming communities experienced (Reflective Journal Entry: 2015).

Cleaver (2001) and Mosse (2001) write that "unmitigated participation holds the risk of confirmation of the pre-existing power structure, often captured by local elites". However, the bias in my research tended toward the position of the poorest

farmers. With regard to understanding how social hierarchical relationships were maintained in the sugarcane fields, I drew from the work of Carswell (2000), who had previously studied the role of gender and family relations in the sugarcane farms of Fiji.

Simonds et al (2012) state that ethnographic investigative methods such as participant observation can offer full and valuable data on issues lurking behind the scenes of interviews, questionnaires and quantified surveys. To become aware of local debates in the sugarcane belts, I employed particular strategies that involved me meeting random people in the towns, attending village rituals and celebrations, and being part of gatherings in the homes of the sugarcane farmers. There, I would join in conversations about topics related to my research with the people present. In this way, I learned how each new problem the farmers were faced with was linked to earlier problems, and that the solution to each problem was implicated in the solution to another problem.

> I am learning of the many problems faced by the different layers of the industry. I am making short trips whenever possible to farms. I am striking up conversations with people in towns in relation to my topic. I am also being invited to gatherings and meetings. I am sometimes meeting people at the bus stop whom I suspect are from sugarcane farming backgrounds (usually the older generations) and starting up conversations with them about my research topic. Surprisingly, all of them have spent parts of their life either as a sugarcane cutter, farmer, or as someone who was once part of the industry. I am also learning of the transitions in the sugar industry in Fiji, and how they have affected people and their livelihoods. At times, I am ending up in village gatherings as part of different functions being held there. The main topic (among the older generations) of conversation during these functions always resonates around sugarcane farming and payments because everyone is from a farming background. As the night matures, those people who are sitting around drinking Kava are becoming more informal, and the stories they are telling me get more interesting, with people recalling the olden days of sugarcane farming (Reflective Journal Entry: 2015).

By immersing myself in the daily lives of the farmers and becoming part of their family, I witnessed first-hand the difficulties they were faced with every day, which were similar across all the sugarcane belts. The information captured by the informal farmer interviews and participant observation were complemented by data sourced through the focus group discussions. Some farmers, however, were more comfortable engaging in conversation during informal interviews than in the more direct focus group discussion. But generally, depending on the farmer's preferences, the strengths of one research instrument was able to be used to compensate for the weaknesses of another.

One drawback of participant observation in my experience was that it made female members of the household uncomfortable. Women often became embarrassed when being observed in their normal everyday tasks. Also, when female household members were asked to discuss topics concerning their farms and livelihoods, many of them passed the questions over to a male member present.

Participant observation contributed majorly towards answering research question numbers 1-7.

3.4.3 Informal Farmer Interviews

According to Qu and Dumay (2011), interviews provide a useful way for researchers to learn about the world of others, although real understanding may sometimes be elusive. The informal interview, also known as unstructured interview, with reference to DiCicco-Bloom and Crabtree (2011) originates from the ethnographic tradition of anthropology.

Informal farmer interview is one of the most important data collection methods to be used in conducting field and ethnographic research in agronomical studies (Sattar et al: 2017). In the present research, informal farmer interviews were an ongoing exercise during the fieldwork with farmer participants and entailed eliciting information on their farming knowledge, the history of the sugarcane industry past and present, the way farmers organized and managed their households and farms, the problems they faced and what they thought of as solutions to their problems, the risks they encountered, and, in general, their strengths and weaknesses.

Informal farmer interviews generated notes and quotations originating from the stories and narratives of farmer participants relating to their everyday lives. In a study by McKim (2017) on the significance of quotations, stories and narratives, research participants stated that it is vital that their voices and stories be heard throughout the research findings. Quotations are parts of the stories, and without them it is hard to hear the voices of the story tellers (p210).

However, there is a limitation to the use of informal farmer interviews when the participants speak a different language. In my case, the quotations, stories and narratives were originally recorded in the farmer's own language and then later translated into English. In the process, the full force or meaning of what was being said was often lost, especially when, as with some *Girmitiya* words originating from the sugarcane farming belts of Fiji. There was no direct English translation.

Informal farmer interview contributed majorly towards answering research question numbers 1-6.

3.4.4 Focus Group Discussions

Focus group discussions were conducted with sugarcane farmers primarily to gather their opinions, beliefs, and attitudes toward major policy initiatives concerning 're-diversification', 're-intensification', 'mechanization', and 'conservation of agrobiodiversity', and strategies for food and income security.

Jackson (1989) draws attention to the importance of debating and exchanging points of view with participants. Reciprocal exchanges of this nature occurred during focus group sessions and added to my understanding of the worlds of the sugarcane growers. At times, I had to intervene to aid the flow of communication, identify social cues and put respondents at ease so that weaker participants, who they seemed overpowered by the stronger ones, could be listened to.

The focus groups discussions drew on pre-existing knowledge of agronomic issues, and at times revealed a certain like-mindedness between the way of thinking of my research participants and my own environmental/agroecological/anthropological research approach. They also allow participants to expand on each other's responses and reactions (Beyea and Nicoll: 2000). In this research, refining opinions on issues raised by other focus group participants called for better explanations. At the same

time, the method presented certain logistical difficulties that required a heavy investment of patience, dedication, and personal energy.

> The focus group discussion sizes varied from six participants to a maximum of fourteen. It is a challenging technique, as I have to work according to the convenience of the participants. In fact, it is the most difficult method among the others that I am utilising in this research, following Singh and Sureja (2005). I am inviting at least 20 participants for each session. I am also encouraging farmers representing various age groups, and provision is being made for equal gender opportunities. However, it is difficult to include many people from different locations due to the distance between the towns, even in the same sugarcane belts. It is becoming extremely problematic for the farmers to converge at a designated venue that is convenient for both, them and myself (Diary Entry: 2015).

> I noticed that many participants have problems with timing while others have difficulty with the day and the venue. This was very common in the Sigatoka-Nadi and the Lautoka-Ba regions. Therefore, I was able to conduct only one focus group discussion per region. Since there were many disputes among the members coming from these areas of the sugarcane belt, I had to keep reviewing my strategies as to how to convene a focus group. I knew, however, that I had to, with all the difficulties surrounding these two regions (Reflective Journal Entry: 2015).

In the face of such difficulties, I sometimes changed the strategy for conducting the focus group discussions. For instance, in Lautoka, the focus group session was conducted in the sugarcane fields without any prior appointments and logistical arrangements. In the end this helped me to interpret the information and the experiences of the participants better, as the discussion was taking place in a setting which the farmers had immediate knowledge of, and they could relate directly to their problems in a space that was their own. The analysis made from this focus group session focused on the "real life" interactions between members and the sugarcane field.

I had no problems in organising the focus group in the Tavua-Rakiraki and Labasa-Seaqaqa regions. This is because I had made many earlier contacts through my networks, and they were ready to assist me with the process of focus groups. After confirming with them the dates I was planning to schedule the focus groups, the participants agreed to take part in the discussions. Additionally, my contacts organised the timings and venue. My only job was simply to arrive at the venue and facilitate the discussions while the logistics were all taken care of by them. These contacts were sugarcane farmers or prominent members of the community in those regions. I conducted two focus groups in each of these regions this time. Both of the focus groups in the Labasa-Seaqaqa section took place at one of the participant's home where we were served with food, juice, and Kava by the household. The focus groups in the Tavua-Rakiraki region took place at the Fiji National University Rakiraki Campus where I had taught previously on several occasions.

Focus group discussions contributed majorly towards answering research question numbers 1-7.

3.4.5 Agroecosystem Analysis and Livelihood Survey

The agroecosystem analysis and the livelihood survey components of the research complemented and supplemented the data obtained via farm-based participant observation. Agroecosystem analysis is a methodology that was developed in the late 1970s (Conway: 1983), and since then has been applied to South East Asia and other parts of the world for analysing agricultural livelihood systems, and for planning and prioritising research and development activities (Endure: 2010). The method is flexible enough to be applied in research and extension planning in a range of locations and environments. The livelihood survey combines the livelihood portfolio of rural activities and expenditures.

Agroecosystem analysis was used to gather information relating to sugarcane farming production methods, cropping techniques and patterns, crop management practices, soil, water and fertility management practices, modes of conserving agrobiodiversity, and perceptions of high yielding varieties, weed management and pest management. The results obtained are presented in Chapters Six to Ten. The livelihood survey was used to capture bio-physical and socio-economic data relating to ethnicity, socio-economic status, agriculture systems, agroforestry

systems, access to markets, and information on the effects of climate, topography, geology, water resources and land use. The findings are presented in Chapter Six.

In addition, these two methodologies were used to identify and better comprehend various aspects of ITK related to farm productivity, stability, sustainability, and equitability vital to the success of an agroecosystem (Conway: 1983). The techniques also identified areas of concern useful for rural development, extension services, and research programs.

The limitations of agroecosystem analysis and livelihood survey as research methods is that their standardised format does not make provision for the free expression of the farmer's voice. Informal and semi-structured interviews and focus group discussions were used to gain this, and the farmer's voice was given expression, particularly in the findings; Chapters Eight and Nine. The data gathered through the agroecosystem analysis and livelihood survey is used to corroborate or supplement information gathered from farmer's statements. In some instances, the agroecosystem analysis revealed important data not addressed during interviews; for example, the presence of crops that had not been identified during informal farmer interviews.

Agroecosystem Analysis and Livelihood Survey contributed majorly towards answering research question numbers 1, 3, 5 and 7.

3.4.6 Semi-structured Interviews

The semi-structured interviews with industry stakeholders were used to identify the agricultural problems and socio-economic issues that might be addressed through appropriate extension and research programs. These interviews had to be conducted at a time and day when the participant was available, and took place during working hours at the offices of organization where the interviewee was employed. They ranged in time from a minimum of twenty minutes to a maximum of one hour, depending on the interviewee's availability and work schedule.

Information gained through participant observation and informal interviews with sugarcane growers relating to the problems faced by farmers in their sugarcane fields was triangulated with how these problems were seen and understood by other industry stakeholders to discover differences in how the different stakeholders

thought of the various solutions being implemented in order to salvage the collapsing sugar industry.

To broaden the range of perspectives, effort was made to include in the study other groups of people who are also part of the sugar industry, such as sugarcane lorry drivers, sugarcane cutters/labourers, *sirdar,* and the children and grandchildren of sugarcane growers.

Semi-structured interviews contributed majorly towards answering research questions 1, 2, 6, and 7.

3.5 Population Size and Sampling Methods

The research used 'stratified convenience sampling technique'[3] for recruiting participants. I first used my existing network from the Fiji National University and from the western region of Viti Levu and the northern region of Vanua Levu in Fiji for the initial recruitment of participants for this research project. I then used these contacts, using the stratified convenience sampling technique, to build further my participant numbers who I approached to take part in the semi-structured interviews and participate in the focus group discussions. The majority of the sugarcane farmers who took part in the focus group discussions also made themselves and their farms available for the participant observation, informal individual interviews, agroecosystem analysis and livelihood survey. The sample size, selection of participants and the method of their recruitments are described in the next section.

[3] *"The stratified convenience sampling procedure is characterised by drawing research participants that are both easily accessible and are willing to participate in a study. It is influenced by the representation of the research cohorts on characteristics of interest which combines stratified sampling with random sampling. This allows the researcher to discover and describe in detail characteristics that are similar or different across the strata or subgroups",* refer (Charles, T. and Fen, Y. 2007. Mixed Methods Sampling: A Typology with Examples. *Journal of Mixed Methods Research,* 1**,** 90.).

3.5.1 The Sample Size and Selection of Participants

The total number of participants recruited for this research project was 116 (refer Table 3.1).

Research Techniques	Sample No.	Research Cohort Type
Semi-structured Interview	12	Government and the stakeholder institutions in the Sugar Industry: (MoS, MoA, CPA's (LCPA), SCGF, SCGC, FSC, FT, SRIF, SRG, SPC/EU)
Focus Group	55	Smallholder sugarcane farmers, Sector Officers, FT Officer, Sugarcane Cutters, Sugarcane lorry drivers, *Sirdar*, *Paniwala*, *Hukmaan*, Sugarcane producer association director, FSC Field Officer, family and relatives of sugarcane farmers
Participant Observation Livelihood-Survey Farmer Interviews Agroecosystem Analysis	33 + 16	Master Sugarcane Farmers (descendants of *Girmitiya* and *iTaukei*) + Children, Grand Children, and Relatives of Master Farmers
Total	**116**	

Table 3.1: Research sample size and cohort types

3.5.2 Method of Selecting Participants

I had designed a step-by-step approach described below to gain access to the research participants (refer Table 3.2).

Steps	Approach
1	Identify possible participants and villages for conducting the research through own contacts
2	Seek permission from village Chiefs and *Sirdars* (Sugarcane Gang Leaders) to enter identified sugarcane villages
3	Present *iSevusevu* (formal Kava ceremony) to village Chiefs for acceptance into the village.
4	Administer informal gathering (Kava sessions) for data collection
5	Identify other participants during the informal gatherings to partake in the scheduled focus group discussion
6	Administer the focus group discussions
7	Identify participants for participant observation, livelihood-survey and agroecosystem analysis using the stratified convenience sampling technique during the focus group discussion
8	Carry out participant observation, livelihood-survey and agroecosystem analysis with the participants identified through the focus group discussion
9	Administer semi-structured interview with Government personnel, FSC workers, research and extension staff and external parties related to the sugarcane industry

Table 3.2: Steps taken for selection of research participants

However, I had to vary this approach from time to time. For example, (Step 3) I did not present *iSevusevu* to any of the village chiefs where the research took place as my *iTaukei* participants informed me that there was no need to do so, and that I was welcomed to the village and the sugarcane farms at any time. I did not therefore have to administer informal Kava session myself. Instead, my participants were

very welcoming and did this themselves for all who were present. They had also treated me to lunch and refreshments wherever possible, even when I had informed them that I would be taking care of this logistics.

I had to reverse steps 7 and 6 for the execution of the focus group sessions because of issues of time, venue and distance. For two of the sugarcane regions, I had to carry out the participant observation, livelihood survey, and agroecosystem analysis before the focus group session actually took place. This was for the Sigatoka-Nadi and Lautoka-Ba regions.

I did not carry out the semi-structured interviews with the industry actors as the final step in the research but instead did this over the whole year of the research period because their accessibility was highly dependent on a time when they were available at the various vicinities to meet me. This entailed me continuously moving in and out of the sugarcane fields when there was an interview scheduled.

3.6 Data Processing and Analysis

Bazeley (2002) writes that methods of inquiry often combine nomothetic and idiographic approaches in an attempt to serve the dual purposes of generalisation and in-depth understanding. The purpose is to gain an overview of social regularities from a larger sample, while at the same time understanding the other through a detailed study of a smaller sample, although the full integration of these approaches is difficult.

3.6.1 *Qualitative Data Analysis*

The six focus groups held in the four sugarcane regions were audio and video recorded whilst the semi-structured interviews and the informal sugarcane farmer interviews were solely audio recorded. As Cohen et al (2000; 2011) caution, audio transcription does not necessarily reflect the interview in its entirety due to the missing tonal or body language cues participants engage in when discussing or responding to the researcher or the other participants in the group. This is particularly true in a Pacific Island setting where the voice tone, body language, and the behaviour of participants tend to reveal more information on a situation than that based solely on narrated value. Therefore, videos, field notes, diary entries, reflective journal entries were incorporated to capture and gauge ‘non-verbal

communications' cues, and retain a sense of the participants' social and contextual interactions.

After a year of fieldwork in Fiji, all the information gathered through focus group discussions and interviews was transcribed into a verbatim record. This information was then coded for analysis purposes. A preliminary code 'A', 'B', 'C', etc. was allocated to statements, paragraphs, sentences, etc. based on the subject area of the information they contained. For example, all information concerning 'Problems of the Sugar Industry' was coded 'C'. The code 'C' data was then filtered and refined using a secondary set of codes, 'CA' (Problems of World Trade), 'CB' (Problems of Production), and 'CC' (Farmer Problems). I also looked for important words, such as 'crisis', 'cane payments', 'climate', 'drought', 'politics' etc., to help in develop analytical themes. For example, discussions on 'drought' were placed under the analytical theme of 'Climate, Pests and Diseases' (refer Figure 3.3).

During this second stage of coding, indications in the recorded interviews of the participants' attitudes, such as actions, criticisms, tone of voice or use of foul language were coded using the numerical values '1', '2', '3', etc. These codes were used to interpret more accurately the meaning of statements in the verbatim record. It was possible to identify each participant by their voice and to note the meaning of the different voice inflections and general discourse tones due to the familiarity that had been built up during the fieldwork phase of the research.

At times, participants gave vague (not specific) responses during interviews. From such responses, keywords, such as 'FSC' or 'government', were captured and used as the basis for later discussion with the participants to clarify their meaning during the data triangulation phase. For instance, where a farmer may have been criticizing the government or the FSC for failures in the sugar industry, but without making reference to where they thought the problem really lay and who was to blame for it, this would be brought up for clarification in later discussions.

At a third set of coding, information coded 'CA' (Problems of World Trade) for instance, was refined to 'CAA' (Loss of Market), 'CAB' (End of FairTrade Premium), 'CAC' (Fluctuating Market Price), and 'CAD' (Geographical Isolation). Information coded 'CB' (Problems of Production) was filtered and refined to codes 'CBA' (Declining Farmer Numbers), 'CBB' (Loss of Farmer Confidence), 'CBC'

(Loss of Production to Urban Development), 'CBD' (Milling Inefficiency), and 'CBE' (Climatic Factors, Pests, and Diseases). That coded 'CC' (Farmer Problems) was filtered and refined into codes 'CCA' (Industry Representation), 'CCB' (Security of Land Tenure), 'CCC' (Scarcity of Labour), 'CCD' (Rising Costs), and 'CCE' (Local Politics and Conflicts). Finally, the narratives and stories of participants concerning different themes were coded. For example, for narratives on the theme 'Local Politics and Conflict' were coded 'CCEA' (Farmer Inequality), 'CCEB' (Cases of Fire in the Fields), and 'CCEC' (Favouritism and Power).

This pattern of coding helped in establishing and analysing the different themes/topics for each chapter.

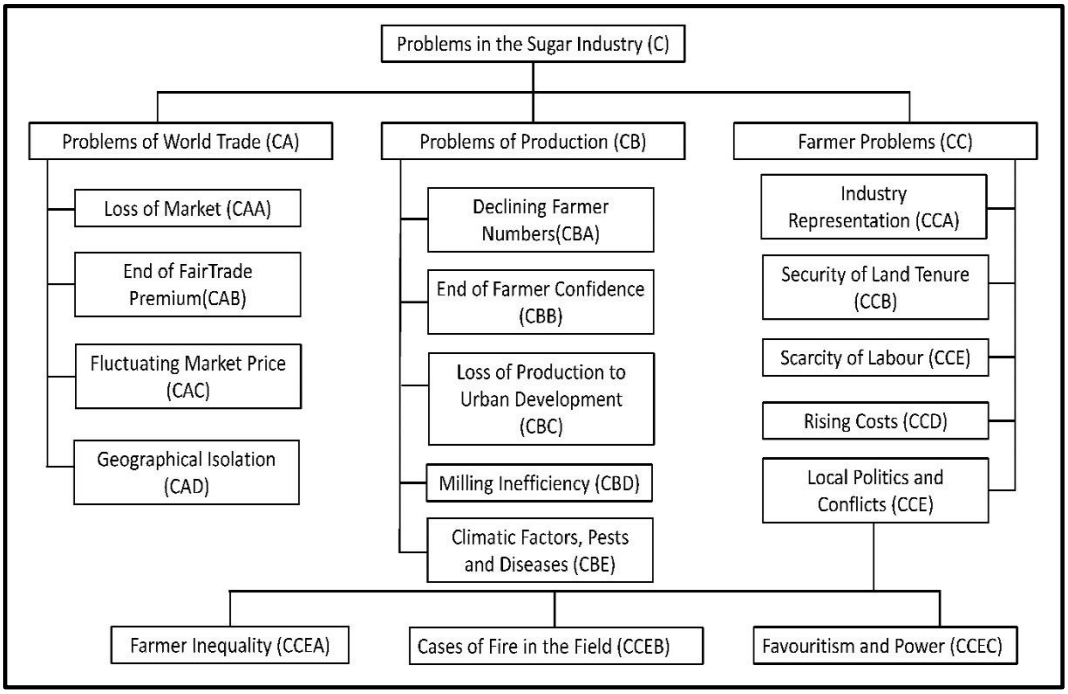

Figure 3.3: Coding of data

3.6.2 *Quantitative Data Analysis*

Microsoft® Office Excel Spreadsheet and SPSS 22 software was used for the analysis of quantitative data obtained from the agroecosystem analysis and livelihood survey sheets. The Spreadsheet was used to prepare the tables and graphs that appear in Chapters Six, Eight and Nine. The first stage of the statistical analysis

involved feeding all the variables[4] into the SPSS. The responses[5] to each variable were coded using a number. The descriptive statistics obtained were then used to identify the percentages, summary of frequencies, means, and comparative studies of the data.

To make sense of the current trends in farm production, stability, sustainability, and equitability, the data sets incorporated information obtained from the livelihood survey and agroecosystem sheets (refer Appendix H and I). The conversion of qualitative data into numerical values assisted in understanding the correlation between the agrobiodiversity use, vulnerability, and conservation that in turn allowed me to relate the traditional farming practices with some of the indicators of a sustainable society.

3.6.3 Internal and External Validity of Qualitative Data

In qualitative research, the accuracy of research findings is considered as being collaboratively determined by the researcher and the participants (Creswell: 2003; 2014), and it is the researcher's responsibility to provide 'sufficiently rich data' so that readers can assess the authenticity and accuracy of the study for themselves. Booth et al (2008) point out that the researcher does not have to follow a set of how-to rules, but rather create opportunities for the voice of the research participants to be heard, for others to reflect upon.

Strategies applied to validate the findings of this PhD research as accurately as possible were the triangulation of the qualitative data obtained via participant observation, focus group discussions, semi-structured and informal farmer interviews with the quantitative data obtained through the agroecosystem analysis and the livelihood survey questionnaire. The triangulation of data refers to the use of different sources of data to help in increasing the trustworthiness of research (Leech and Onwuegbuzie: 2007; Wray et al: 2007; Mertens: 2010; Jick: 1979). It is used to confirm (Morgan: 1998), cross-validate (Darren and Nick: 2001), endure,

[4] Variables here refer to the questions that were part of the agroecosystem analysis and the livelihood survey questionnaire.

[5] The responses to the questions were either direct in nature such as a 'yes' or 'no' to choose from, or there were series of pre-conceptualised answers that were presented to the participant to choose from. Each response was then coded using a number which was later analysed using SPSS.

and corroborate findings (Mertens and Hesse-Biber: 2012; Creswell and Miller: 2000).

Denzin (1978) defines triangulation as "the combination of methodologies in the study of the same phenomenon". Denzin outlined four types of triangulation: (i) data triangulation (i.e., use of a variety of sources in a study), (ii) theory triangulation (i.e., use of multiple theories and perspectives to interpret the results of a study), (iii) methodological triangulation (i.e., use of multiple methods to study a research problem), and (iv) investigator triangulation (i.e., the use of several different researchers).

The present study is based on the two of triangulation types outlined by Denzin above; i.e., data triangulation and methodological triangulation. Triangulation was applied in this study to explore the role of ITK in sugarcane production by means of (and comparing) data captured using both quantitative and qualitative methodologies. For example, farmers' responses during the focus group sessions to questions about the decline in production of sugar in the sugar industry of Fiji were compared to answers in the agroecosystem analysis and livelihood survey questionnaires to questions about sugarcane outputs.

Another example of triangulation was comparing the data on the high production expenditures given during the informal interview session with their quantified responses given during the surveys. I noted that there were some inconsistencies between the qualitative and quantitative data, for instance, between what farmers said in interviews and what they reported in the livelihood survey. Member checking[6] was then used to ensure the trustworthiness of the interview responses.

Member checking involved respondent validation, correcting factual errors, adding further information and putting information on record. This, in turn, provided summaries and assisted in checking the adequacy of the analysis. I continuously contacted many of the participants and/or their children/grandchildren back in Fiji via the social media sites and e-mail correspondence to ensure the authenticity and

[6] Member checking is also known as informant feedback or respondent validation. It is a technique that helps improve the accuracy, credibility, validity, and transferability (also known as applicability, internal validity, or fittingness) of a research.

validity of the research findings. This gave them the opportunity to ensure that the information recorded accurately reflected their perspectives.

The terms ‘comparability’ and ‘transferability’ are used in qualitative research (Creswell: 2003) to refer to the degree that the findings of the study can be generalised to a larger population, settings, culture or situations (Cohen et al: 2011). Cohen et al have called this ‘external validity’. By considering comparability and transferability, research can provide insights that may apply to other settings. For example, in this research, the data was collected from 33 master farmers who took part in the agroecosystem analysis and livelihood surveys, and the question is to what extent the results can be said to represent the situations prevailing for other sugarcane farmers as well.

As I stayed at each sugarcane region for a maximum of only three months, I had only one opportunity to clarify with the farmers their responses in the focus group discussions and informal interviews, therefore member checking was applied simultaneously during focus groups and interviews. Restatements or summaries of information given by the farmers were made, to check with them if the interpretation of their responses were correct.

Where farmers disagreed with the statements, they were provided with opportunities to correct the assertions in order to reflect properly their views. Once they had agreed to the final versions of the recorded statements, summary drafts were again presented to the participants for confirmation and further illumination. In the Tavua-Rakiraki region, the participants of both focus groups summarised their responses onto flip charts and handed them to me for reference purpose because they knew that it would be difficult for us to communicate once I had returned to Aotearoa/New Zealand.

3.6.4 Reliability of Quantitative Data

To ensure the logical validity[7] of information generated via the numerical data requires that the research instruments fairly and comprehensively address the aim and research questions of the study (Cohen et al: 2011). To achieve this, the questions in the agroecosystem analysis and livelihood survey were adapted from the FAO and ILO (2009, 89-91) and adjusted to suit the research context and also to ensure the content validity of the instruments in my 'research inquiry model'. The questions were also piloted with a small group of sugarcane farmers' children at the Fiji National University where I worked previously. The model questions architected by FAO and ILO livelihood survey have been widely accepted and documented as valid and reliable.

3.7 Insider and Outsider Research: Identity and Access to Information

Walsh (1998) writes "observation, inquiry, and the collection of data depend upon the researcher gaining access to the appropriate field and establishing good working relations with the research participants…[and] the identity that the researcher assumes determines the success of this". This is elaborated upon by Anderson (2000) who cautions, "one's identity opens doors and people's hearts as much as it engenders suspicion or envy". In the present research, my identity was somewhat ambiguous, as both an 'insider' and an 'outsider' of the research community (refer Section 1.5.1).

Smyth and Holian (2008) write that, in general, 'insider researchers' have a great deal of knowledge that it takes an 'outsider researcher' a long time to acquire. As a direct descendant of the *Girmit* community in Fiji, I was, to a large extent, positioned in this research as an 'insider'. I shared in many of the cultural values and ideals of the cane farming *Girmitiya* community, and the benefits of this were that I already had an understanding of the *Girmitiya* culture. My ability to speak

[7] Logical validity is also known as content validity. An argument is 'logically valid' if it is in principle impossible for the premises to be true and the conclusion to be false at the same time, for example if during the agroecosystem analysis the farmer stated that they were earning little from their produce, then I had to accept that low incomes affected the farmer's capability to increase the sugarcane production on his farm, even though this may not necessarily be true. However, if in the sugarcane field, I observed that the same participant had robust growth of the sugarcane, then it was imperative for me to nullify the claim and logic made in the agroecosystem analysis.

fluently in the range of different languages spoken in the country, including Fiji Bāt, Urdu, and English and basic *iTauke*i Bauan dialect was also an advantage, as my hosts were more comfortable communicating their ideas in their first language. Even my previous research experience (Dean: 2010) in India, in rural villages in the state of Bihar during my M.Sc. studies was fortuitous, as the majority of the *Girmitiyas* in Fiji were sourced from Bihar State, and many still have kinship links to Bihari Indians.

I was also an 'insider' (in an educational role) in the sugar industry, and was already generally aware of the structure and politics of stakeholder institutions in the industry; their formal hierarchies and how they worked. From 2011 to 2014, I was employed by the Fiji National University (FNU) at the Naviti Campus, in Lautoka, as a Lecturer and Training Officer in the disciplines of Environmental Management, Green Productivity, and Occupational Health & Safety, and the job often required me travelling to the different towns of the western and the northern regions of Fiji for teaching. As a result, I was already very familiar with the sugarcane regions and had taught personnel from the SCGC, SCGF, FSC, SRIF and SPFL on several occasions. I had maintained good relation with them, and these contacts helped me later when I returned to Fiji to carry out the fieldwork.

On the other hand, since I am not directly linked to, or originally from a sugarcane farming background, I was an 'outsider' approaching the community as a professional researcher. As a university educated person, I was received by my hosts with the respect and formality that they felt due to such a person, and they ensured that all my needs were met in a timely and appropriate manner while they educated me about their lives and the realities of the farming life. Hence, the social distance that they perceived between the university educated researcher and sugarcane farmers was mitigated by the warm and open nature of the people with whom I worked. This warmth and openness allowed me to develop deep personal relationships with my hosts, and thus to gain a better understanding of the realities they faced.

I continued to maintain good rapport with my research participants even after returning to Aotearoa/New Zealand at the end of the information-gathering phase of the research. The industry stakeholder participants had provided me with their e-mail contacts, and many of the farmer participants established online connections

with me through the social media websites in case I later needed to re-validate the data for accuracy and precision. These online connections were very useful, as at times I had to seek clarifications, ask for further information and re-validate information. This correspondence continued at both the professional level as an 'outsider researcher', and the personal level as an 'insider descent of the *Girmit* community' and 'adopted family member'.

One limiting aspect of close cultural identification with the cane farming community was being constrained by existing gender divisions. Work in the sugarcane fields of Fiji is heavy and seen generally as 'men's work'. For this reason, the fieldwork respondents were all men: fathers, sons and grandfathers. Efforts were made to capture the knowledge of the women of the respondent households, but in most cases, this was found to be impossible, as I did not wish to put female research participants in an embarrassing situation by asking culturally inappropriate questions. As a result, female members of farming households were usually left out, even though they showed interest.

It may have been possible to overcome this under-representation of women in the research by being present in places where women gathered, such as places of worship, religious gatherings and other events. However, here there exists cultural and religious barriers to an 'outside man' participating in these areas. It is possible therefore, that research conducted by a female researcher would elicit a different perspective on sugarcane farming in Fiji (refer for example Carswell 2000; 2003).

3.8 Chapter Summary

This chapter has described the mixed methodology used in this study, framed by the need for a new cross-disciplinary model of agricultural research called for by the IAASTD (2009). It has described the multiplicity of research methods used, drawn from the disciplines of both agronomy (agro-systems analysis and livelihood survey) and the social science (participant observation, semi-structured interviews, focus group discussions, informal interviews, and literature and archival research), the various methods of data analysis (both qualitative and qualitative) and their respective modes of validation, and discussed the implications of the position of the researcher as both 'insider' and 'outsider' in the research context. The next two chapters present a review of the literature informing the analytical framework of

the thesis, the global context of sugarcane production, and the historical background of sugarcane growing in Fiji.

Chapter 4 Sugarcane and Policies

4.1 Introduction

Sugarcane (*Saccharum officinarum*) is one of the oldest commercial crops found in the tropics and subtropics. According to Srivastava and Rai (2012) it is indigenous to South-Southeast Asia. First described by Linnaeus in 1753 (Reveal et al: 1989), the sugarcane plant is a tall grass of the genus *Saccharum* of the *Poaceae* family represented by a stout, jointed, fibrous stalk of 2-6m in length (Clark et al: 1995). According to Glyn (2004), there are records of the use of sugarcane in India and China as far back as chronicled history goes, but there is little doubt that primitive man cultivated the crop long before then.

Artschwager and Brandes (1958) write that there were two periods of sugarcane movement. The first dating back to the early cretaceous period when the enormous Asiatic-Australian continent allowed for the movement of primitive Asiatic canes through a land bridge unaided by man to the region known as Melanesia. The second was brought about by the advent of flooding conditions during the late cretaceous period over the Asiatic-Australian continent. Later, those species that were highly prized by humans accompanied them on their early travels. Brandes (1929) notes that during this time, there were three main movements from New Guinea into the Pacific and Asian regions. The first movement introduced *Saccharum officinarum* to the Solomon Islands, Vanuatu, and New Caledonia around 8000BC; the second was in a westerly direction to the Philippines, Indonesia, and ultimately the Indian subcontinent through the Malayan Peninsula and Burma around 6000BC; the final movement took place around 600AD to 1100AD to Vanuatu, Fiji, Tonga, Samoa, Cook Islands, the Society and Marquesa Islands, the Easter Island, and Hawaii. Hawaiian legends refer to sugarcane being brought around 750 to 1000AD.

The next section discusses the sugarcane crops global importance and significance followed by a discussion on some of the major sugar producers, importers and exporters. Next, a section discussing some of the major international trade agreements and policies that have had an impact on the development and shaping of the sugar industry in Fiji is presented. This is then followed by a section on the

consequences of these sugar policies for the Fiji sugar industry. A chapter summary forms the final section.

4.2 Sugarcane Crop: Global Importance and Significance

Today, sugarcane is a crop of global commercial significance, and it has supported the industrial development of many countries, including Fiji. Globally, sugarcane occupies an area of 20.42 million hectares giving a total annual production of 1,328 million metric tonnes of sugar (FAOSTAT: 2005). It accounts for about 80 percent of global production of sugar, with the remaining 20 percent produced from sugar beet (International Plant Biotechnology Outreach: 2018).

From 1950 to 1994, world sugar consumption grew at an annual rate of 3.1 percent, almost quadrupling from 29,791 million tonnes to 113,798 million tonnes (Ahmad: 2014). Almazán et al (1998) note that even with the appearance of new sweeteners on the market, sugar is still the most widely used caloric food in all countries, especially among lower socio-economic classes, where unfortunately it is a major contributor towards diabetes.

The sugar industry is one of the main sources of employment in many poor, structurally weak economies. Its development has underpinned the economic growth of Fiji since the 1880s and about a quarter of the country's population is currently directly or indirectly dependent on the sugar industry for their survival (Kumar and Prasad: 2004). Most of the sugar produced in Fiji is exported to international markets where it makes an important contribution to Fiji's foreign exchange earnings (Kumar and Prasad: 2004). Even though Fiji's dependence on the sugar industry has declined substantially in recent decades, sugar remains an important commodity (Ratukalou: 2012). In the near future, however, the Fiji sugar industry faces great uncertainty (Morris et al: 2017). This is attributed to reform of the EU's sugar regime, downside risks to global sugar demand, and competition from much larger producers of sugar.

4.3 Major Sugar Producers, Importers, and Exporters

In 2000-2002, total global sugar production was 139.8 million tonnes, total sugar imported was 45.7 million tonnes, and total exports was 47.9 million tonnes (refer Table 4.1). The top three producers were Brazil, India and the EU. The top five exporters, the EU, Brazil, Australia, Thailand, and Cuba, accounted for about 60 percent of the world exports, and the top three importers of sugar were Russia, EU and Indonesia. The EU was unique in that it is one of the top three producers, importers, and exporters of sugar.

Main Producers		Main Importers		Main Exporters	
Country/ Region	**Mil. Tonnes**	**Country/ Region**	**Mil. Tonnes**	**Country/ Region**	**Mil. Tonnes**
Brazil	21.6	Russia	5.0	Brazil	11.9
India	20.7	EU	1.9	EU	6.2
EU	17.3	Indonesia	1.8	Thailand	4.3
China	9.2	Japan	1.6	Australia	3.6
USA	7.6	Malaysia	1.5	Cuba	2.6
Thailand	6.5	Korea	1.5	India	1.5
Mexico	5.2	Nigeria	1.5	South Africa	1.3
Australia	5.1	USA	1.4	Columbia	1.3
Pakistan	3.9	Canada	1.2	Guatemala	1.1
Cuba	3.2	Algeria	1.2	Mauritius	0.5
All other	39.5	All other	27.1	All other	13.6
World	139.8	World	45.7	World	47.9

Table 4.1: Major producers, importers, and exporters of sugar
Source: Huan-Niemi and Kerkela (2005)

According to FAO (2016), Brazil remains the largest sugar producing nation. However, there have been changes in the position of other countries. Brazil is currently followed by India, China, Thailand, Pakistan, Mexico, Columbia, Australia, Philippines, and USA. These are the worlds top ten producers out of 120 countries that grow sugarcane (Srivastava and Rai: 2012; FAO: 2005). Brazil is the top both in area under sugarcane (5.63 million hectares) and sugar production (33 percent of the worlds total sugar production) (FAOSTAT: 2005).

The main driver behind the expansion of land under sugarcane cultivation is the constant rise in the world's demand for sugar. The crop is emerging as a versatile resource, able to be diversified into a wide range of value-added products that go beyond food/sugar to bioethanol and bioelectricity, bioplastics, bio-hydrocarbons and biochemical. Sugarcane is considered one of the best converters of solar energy into biomass, with a conversion efficiency of 2.24-2.29 percent, compared to maize at 0.2 percent. Compared to the three major cereal crops (maize, rice, and wheat),

which collectively occupy 41 percent of the world's cropland, sugarcane is the highest-yielding crop in tonnage worldwide (1.9 billion tonnes) while occupying only 2 percent of the world's cropland (International Plant Biotechnology Outreach: 2018).

Ethanol production does not necessarily require additional cane production, nor does it impact on sugar production because ethanol can be produced from sugarcane bagasse, which is an underutilized by-product of sugar factories (Eggleston and Lima: 2015). In Sub-Saharan Africa, Cellulosic ethanol has the potential to nearly double the amount of fuel that can be produced without increasing the area planted with sugarcane and without competing with food security (International Plant Biotechnology Outreach and Universitiet Gent: 2017).

Eggleston and Lima (2015) inform that the co-generation of bioelectricity from bagasse and leaf residues is increasing, and, due to the high carbon content of bagasse and cane leaves they can also be converted into other value-added products such as bio-char.

In Fiji, the development of high sugar and biomass-yielding sugarcane has been recognized as a possible key for improving the financial sustainability of the sugarcane industry. However, its financial viability is highly sensitive to a consistent supply of feedstock, and the rapid decline of the sugar industry over the last 10 years has deterred investors. A World Bank funded study has shown that molasses based ethanol production requires taxes and levies to be waived in order to make its production by the private sector financially viable (Economic Consulting Associates and SMEC: 2013).

4.4 Sugar Trade Agreements and Policies

Trade agreements and policies are generally seen as essential instruments to support trade expansion and economic growth (Kumar and Prasad: 2004). However, these tend to be dominated by a few large countries, and tend to have a detrimental effect on smaller nations (Larson and Borrell: 2001). USA, Japan, and EU policies on sugar have separately and jointly been criticized for causing significant negative effects on the world sugar price (Borrell and Duncan: 1992).

The world sugar market has long been characterized by price instability (Borrell and Duncan: 1992), which shows up in a pattern of short, sharp price peaks and extended price troughs. It has been said that policies designed to protect producers from price instability have often exacerbated these fluctuations. The expectation among producers of protection against low prices has encouraged them to over-expand their production, but the consequent increases in supply have not been matched by growth in demand, leading to a fall in prices.

Fiji has long been subject to the policies of international importers of sugar. Historically, Fiji exported sugar to the UK/EU, Malaysia, USA, Japan, Korea, China, Indonesia, Taiwan, and Portugal (FSC: 2016; 2014; 2013; 2012). And the trade policies of these countries, particularly the USA, Japan, and the EU have majorly shaped the Fiji sugar industry. A major objective of the Fiji government has been security of supply and conservation of foreign reserves, so high prices in the world sugar market have encouraged expansion of sugar production, even when it has not been profitable for Fiji's economy as a whole. The two surviving agreements are with the EU and the USA. Both countries have heavily subsidized industries with quotas and tariffs, and hence, sugar policy reforms in Fiji have been directed mainly toward reducing production inefficiencies to enhance international competitiveness within protected markets (FAO: 2012).

4.4.1 EU Policies

Garside et al (2005) note that preferential market agreements, such as those with the EU, have defined the sugar industry, such as that of Fiji, since the 19th century. In 1951, the UK signed a Commonwealth Sugar Agreement (CSA) with Commonwealth sugar producing territories. The territories originally covered by the CSA were Australia, South Africa, the British West Indies, Mauritius, Fiji, the East African territories, and British Honduras (now Belize). The CSA lasted until 1974. Moynagh (1977) writes that the agreement committed Britain to buy for herself and Aotearoa/New Zealand specified quantities of raw sugar at an annually negotiated price, and to import for her own consumption, but not for Aotearoa/New Zealand's, additional quantities of commonwealth sugar under a preferential tariff.

According to Ben and Richardson-Ngwenya (2013), the preferential status can be closely associated with the company Tate & Lyle, which in the early twentieth-century established itself as the principal agent linking Commonwealth cane producers and British consumers. Along with British firms such as Booker McConell, Tate & Lyle was able to lobby the UK government to lower duties on raw cane sugar. This was institutionalized in the CSA, and for the first time established contractual purchasing commitments between Britain and her favoured colonial exporters (Ben: 1982).

As part of Britain's accession to the European Economic Community (EEC) (now EU) in 1975, the CSA was 'Europeanized'. However, before formally agreeing, the British government wanted to ensure: (a) that Tate & Lyle could continue to source plentiful cane at stable prices, and (b) that trade ties could be maintained with its former colonies in the Commonwealth. This resulted in the birth of the Lomé Convention that was signed between the EEC and the African, Caribbean and Pacific (ACP[8]) bloc of 46 countries in 1975 (Herrmann and Weiss: 1995).

Under the Lomé Convention, the agreement on sugar, known as the 'Sugar Protocol', was annexed to the Convention, committing the EEC to buy 1.33 million metric tonnes of raw sugar at negotiated prices, typically in excess of world market prices, and, along with other non-reciprocal agreements for bananas, beef, and rum, was held in perpetuity (LaForce: 2013). Signatories to the ACP-EU sugar protocol include 19 countries (refer Table 4.2).

As part of the sugar protocol, Fiji and other ACP countries have enjoyed a guaranteed market in Europe for specified quantities of sugar (Kerkala and Huan-Niemi: 2005). Mauritius has by far received the largest delivery rights to the EU, with nearly 40 percent of total quotas, followed by Fiji, Guyana, Jamaica, and Swaziland. These five countries have together captured almost 80 percent of the total EU quota. The remaining ACP countries; Barbados, Belize, Corte d'Ivoire,

[8] The ACP bloc is a group of African, Caribbean and Pacific Group of States, who are part of the ACP-EC Partnership Agreement. The ACP countries are having preferential market access at the protected EU price as a result of the Lomé and Cotonou agreements (Goulongana: 2003).

Kenya, St Kitts & Nevis, Tanzania, Trinidad & Tobago, Zambia, and Zimbabwe receive less than 5 percent of the quota. The other 15 percent is shared by Congo, Malawi, Madagascar and Suriname (Lucke: 1992).

The EU quota accounted for a major proportion of the sugar exports of Mauritius (81.9 percent), Jamaica (64.5 percent), Guyana (59 percent), Fiji (50.1 percent), Madagascar (41.4 percent), and Belize (38.4 percent), making these countries highly dependent on the sugar protocol. Countries such as Swaziland, Zambia and Zimbabwe, have much lower quotas, and therefore have a lower dependency on the EU markets. Some countries, such as Congo, Cote d'Ivoire and Tanzania produce more than their quota, but did not fulfill their quota for the year 2005 (Zoungrana: 2009).

The Lomé Convention of 1975 was followed by Lomé II in 1979 with 58 ACP countries, Lomé III in 1984 with 65 ACP countries, and Lomé IV in 1989 with 68 ACP countries, and was extended in 1995 to 70 ACP countries (Huan-Niemi and Kerkela: 2005). These countries were allocated guaranteed-price preferential quotas for the import of sugar (raw or white) annually. In 2000, the Cotonou agreement replaced the Lomé Convention, but sugar arrangements remained practically unchanged (Sergey et al: 2004). The cotonou agreement has by far created more favourable trading conditions for the ACP countries than any other agreement, by covering a broader range of products, offering wider tariff cuts and more favourable rules of origins (Paugam and Novel: 2006; O'Neill: 2004).

As of 2012, the ACP group consisted of 80 countries, comprising a unique intergovernmental, transcontinental organization with a history of 36 years of political advocacy, dialogue and tangible benefits from trade, economic and development cooperation among themselves, and is the world's second largest trading bloc of the EU (Ambassadorial Working Group: 2012).

Fiji has been enjoying preferential access to the EU as part of the EU sugar protocol and has also been able to sell their sugar to global markets through various other global sugar policies. The EU sugar protocol was scheduled to formally end in 2017 and a transition period from 2009-2017 was set for all sugar producing nations having preferential access to EU to adapt and develop measures before access to sugar protocol formally ended. Since 2009, ACP countries which have negotiated

for Economic Partnership Agreements (EPAs), or interim EPAs, have continued to enjoy tariff free access to the EU market, and have not suffered any loss as a result of the loss of their guaranteed market, because the EU has been short of sugar (Roberts: 2012). The EPAs, according to LaForce (2013), allows the EU to provide for duty and quota-free acess for all ACP products except arms.

Country Quotas for ACP* Sugar Protocol, *SPS*, EBA, USA Market (Metric Tonne, Raw Weight Equivalent)				
Countries	**ACP (SP) Fixed**	***SPS* (Average 2000-2002)**	**EBA (Average (2000-2002)**	**USA Quota (Oct 1999-Sep 2000)**
Barbados	50,312	-	-	7,372
Belize	40,349	6,391	-	11,584
Congo, Rep of	10,186	2,809	-	7,258
Cote d'Ivoire	10,186	11,147	-	7,258
Fiji	165,348	24,297	-	9,478
Guyana	159,410	27,090	-	12,637
Jamaica	118,696	23,898	-	11,584
Kenya	0	8,557	-	-
Madagascar	10,760	973	0	7,258
Malawi	20,824	10,918	10,532	10,531
Mauritius	491,031	26,128	-	12,637
St. Kitts and Nevis	15,591	-	-	7,258
Suriname	0	-	-	-
Swaziland	117,845	38,908	-	16,850
Tanzania	10,186	2,734	9,191	-
Trinidad and Tobago	43,751	8,011-	-	7,372
Uganda	0	13,264	0	-
Zambia	0	26,463	8,887	-
Zimbabwe	30,225		-	12,637
Total ACP SP	**1,294,700**	**231,589**	**260,199**	**170,324**
Total all quotas	**1,956,812**			
Production in Western Europe (av. 2000-2002)	**20,693,001**			
World Production (av. 2000-2202)	**403,444,000**			
*All ACP Sugar Protocol Signatories (*SPS*) are members of the ACP Sugar Group. All five EBA-countries are also members of the Least Developed Countries (LDCs) Sugar Group. 0 indicates that the country has a zero quota. - indicates that the country is not eligible under the trade regime.				

Table 4.2: Country quotas for ACP Sugar Protocol, SPS, EBA, USA Market
Source: Garside et al (2005)

4.4.2 USA Sugar Policy

The USA is a major sugar producing country and has a long history of protecting its sugar industry. The first congress of the USA imposed a tariff on imported sugar in 1789, primarily for the purpose of gaining revenue (Alvarez and Leo: 2012), and in 1842 the policy was adjusted to protect the USA Sugar refining industry and

encourage domestic production. This was done by creating a higher tariff for imports of refined sugar than for raw sugar. The 1981 USA Farm Bill allowed for higher governmental control over sugar than any other major agricultural commodity.

The 1981 bill led to expanded domestic production and higher incomes for local sugarcane growers, but had major implications for countries who had traditionally exported sugar to the USA. This includes reductions in imports, increased trade frictions, and USA's unwillingness to provide meaningful sugar market access during trade negotiations (Pearson: 2015). In 1982, the USA government deemed it necessary to impose sugar quotas. In 1989, an international panel determined that the imported sugar quota in the USA was a quantitative trade restriction prohibited under Article XI of the General Agreement on Tariffs and Trade (GATT), Article XI, *General Elimination of Quantitative Restrictions,* which provides:

> No prohibitions or restrictions other than duties, taxes or other charges, whether made effective through quotas, import or export licenses [sic] or other measures, shall be instituted or maintained by any contracting party on the importation of any product of the territory of any other contracting party or on the exportation or sale for export of any product destined for the territory of any other contracting party (Ahmad: 2014).

The USA responded by creating a two-tiered tariff on sugar imports (Chen: 1995). This encouraged increased domestic production, which eventually threatened to push imported sugar entirely out of the marketplace. To prevent this from happening, the 1990 farm bill created authority for the United States Department of Agriculture (USDA) to impose controls on the marketing of domestically grown sugar.

The American sugar policy is quite different from policies applied to other major agricultural commodities because the USA is a net importer of sugar. The current USA system reserves 85 percent of the USA market for domestically grown sugar, with the remaining 15 percent to be supplied from imports. The import quota is divided among 40 countries based on the quantity of sugar they exported to the USA in the late 1970s and early 1980s.

According to the FAO (2012), recent sugar policy developments in the USA have remained virtually unchanged. Essentially, the USA sugar program creates an incentive for sugar producers in the USA to expand domestic production, which has in turn resulted in import levels at or near minimum access agreement.

4.5 The Effect of EU and USA Policies on the Future of Small Sugar Producing Countries

Research by Garside et al (2005) indicates that for countries having lower quota dependency on exports to the EU and the USA, the potential for industry diversification, membership in regional trade blocs, and higher competitiveness (i.e., lower cost of production) will enable them to take advantage of unlimited access to EU/USA sugar markets under the new regimes. Two countries likely to be on the losing ends are ACP countries Mauritius and Fiji (Laaksonen et al: 2007) because Mauritius and Fiji embrace a wide range of production systems over a large spectrum of agro-climatic, socio-economic conditions and ownership structures. This makes the recommended standardized industrial reforms difficult to achieve.

As a means of supporting the ACP countries after the end of the EU Sugar Protocol, new policies have been institutionalized. These are the Special Preferential Sugar (SPS)[9] agreement, and the 'Everything but Arms (EBA)' agreement. The latter, to which Fiji is not a signatory, is aimed at enhancing market access to the EU by Least Developed Countries (LDCs) (Bruntrup: 2006), but at the expense of ACP quota holders.

4.6 Sugar Policies and Fiji

The sugar industry in Fiji has always been driven and shaped by its export trade activities, with only approximately 10-15 percent of production typically being used for domestic and regional consumption (Ireland: 2012). The largest share of Fiji's sugar exports has traditionally been to the EU under preferential terms, but these will be removed in 2017, leaving Fiji exposed to a volatile and competitive

[9] The Special Preferential Sugar (SPS) is an additional set of bilateral preferential agreements designed to fill the gap in meeting estimated national processing needs. The SPS quota covers approximately 200,000 metric tonnes which can be imported duty free (Elbehri and Umstaetter: 2006).

market environment. Ireland (2012) writes that facing down these challenges will be central to the full potential of the Fiji sugar industry.

With the support of international donors, official policy for the industry in Fiji has been focused mostly on the need to raise the productivity and efficiency of sugar production. With average agricultural yields for Fijian sugar well below the Mauritian average, there appears to be some scope for this. But unless Fiji can achieve a larger share of the remaining USA and FairTrade (FT) preferential markets, any increase in output will have to be sold on the free market at a lower price, contributing to an overall decline in the average price of its sugar exports (Mahadevan: 2008; 2009; Prasad and Tisdell: 2006; Prasad and Lodhi: 1998).

Reddy (2003b) states that Fiji is unlikely to cope with global competition unless serious efficiency and diversification measures are put in place to counter the preferential price erosion. Diversification is an explicit policy objective in Fiji (Delegation of the European Union for the Pacific: 2013), but it will require a large research effort to develop alternative crops, and a continued effort to build an institutional structure for more effective supply chains and marketing systems for its new products.

While Fijian Government agencies are available to provide the industry with technical support and agricultural resources, the highly indebted farmers will have difficulty in financing the improvements, and enthusiasm among farmers for modern innovations is weak. Without effective implementation of a clear strategy to engage sugarcane growers in the determination of the needed reforms, many farmers will be unable to sustain their livelihoods, and the vulnerability of the sugarcane growing community of the past two to three decades will continue into the future.

When the quota regime expired in 2009, EU and ACP sugar suppliers, such as Fiji, were for the first time placed in open competition. More generally, post 2015, ACPs/LDCs face a more volatile trading environment in the EU. According to Roberts (2012), the current ACP sugar quota regime (which ended in October 2015) restricts the volume of sugar that can be sold in the EU markets, and, in their proposals for the future of the Common Agricultural Policy up to 2020, the EU has not proposed to extend it.

Even though Fiji has been a strong regional player with significant exports to Japan and other Asian markets, the EU has long been the most significant destination for Fiji sugar. It has also been benefitting from preferential access to the USA (Ireland: 2012). Future opportunities for the Fiji sugar industry may continue to be shaped by preferential market access, though there may be significant challenges in the shape of shifting policy agendas, particularly in the EU.

According to Prasad and Lodhi (1998), the preferential sugar price under the sugar protocol has made significant contributions to the development of Fiji's economy and rural areas in terms of reducing poverty. It provided a sustained market and price stability for Fiji's sugar, and has helped sustain sugar farming as a productive activity (Kumar and Prasad: 2004; Reddy: 2003a). Therefore, if the EU is to continue its commitment to assisting with the development of the ACP countries, then it needs to engage with various stakeholders in an extensive and inclusive process of ensuring that the objects of poverty eradication and sustainable development are achieved. Given the increasing market volatility and the inevitability of policy changes, future opportunities and sustainable growth may well come from embracing regional opportunities, and from diversified revenue streams.

4.7 Chapter Summary

This chapter has discussed the global importance and significance of sugarcane as a commercial crop, and has provided an overview of some of the major global sugar producers, importers and exporters and the major international trade agreements and policies that have had an impact on the development and shaping of the sugar industry in Fiji. I have drawn special attention to the ending of preferential access to the EU market in 2017 which will place Fiji as a small developing island sugar producing nation in a difficult situation. This, along with the many other problems arising since the 1980s will be discussed in Chapter Eight.

Chapter 5 A History of Fiji and Sugar

5.1 Introduction

Sugarcane plants are thought to be indigenous to the islands of the South Pacific. According to SRIF (2017), native *iTaukei* grew sugarcane for chewing, and they are also known to have used the juice for sweetening food. Fiji's first commercial sugarcane was grown on the plantation system beginning in 1880. Many small mills - 34 in the industry's early history - were erected on the larger island of Viti Levu in high rainfall areas. These small mills were unsuccessful because the sugar content of cane was low and manpower for the plantations was scarce. Today only four of these cane-processing mills remain. Nonetheless, the sugar industry went on to become Fiji's major industry and economic mainstay. Today, however, there are many serious issues facing the industry, and the historical background of these are presented in this chapter, from the beginning of the indenture period in 1879 up until 2014, with a focus upon the struggles experienced by the sugarcane growers.

This chapter is divided into two parts. Part One provides an overview of the indenture period, the operations of Colonial Sugar Refinery (CSR) and British colonialism, and the initial post-colonial, post-CSR period. This is followed by Part Two which focuses on issues arising from the land tenure system. A summary of the chapter forms the final section.

5.2 Part One: The Indenture Period, CSR, and British Colonialism

The indenture period in Fiji, which lasted from 1879-1916, saw some 60,965 *Girmitiyas* brought to the country under British colonial rule (Gounder: 2011, 1). *Girmitiyas* were employed in different areas: on the copra and rice plantations, on cane access roads and *pakki lines* (tram lines), or serving as *Paniwala* (ancillary staff); but the majority were brought to work as labourers on the sugarcane plantations of the Australian owned Colonial Sugar Refinery (CSR). The last ship carrying indentured labourers to Fiji, the *Sutlej V*, arrived in Fiji on the 11th of November in 1916, after which the indenture system for Indian labour was formally abolished (Sharma: 1987, 38). All remaining indenture contracts were cancelled effective from 1st of January 1920 (Lal: 1992, 45). At the end of their indenture, 60

percent of the *Girmitiyas* chose to remain and settle in Fiji (Gounder: 2011), and they and their descendants became the backbone of the sugar industry.

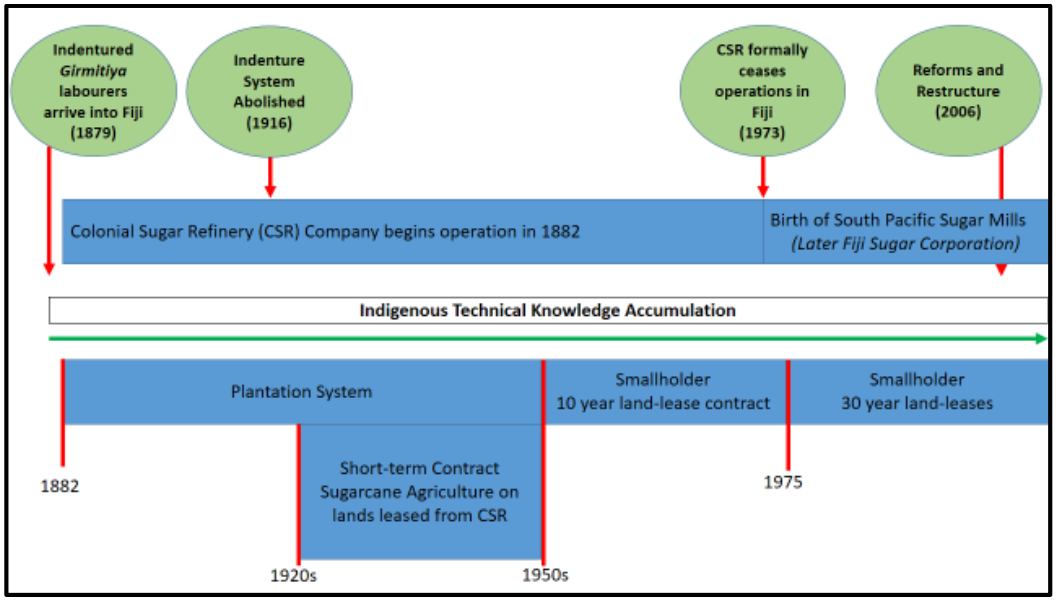

Figure 5.1: Transformations in the sugar industry of Fiji

5.3 The Colonial Sugar Refinery (CSR) and Colonial Rule

In 1882, after many requests from the colonial rulers of Fiji, the CSR extended its operations from Australia to Fiji, and it remained there until 1973 (after which the sugar industry came under direct control by the Fiji Government) (refer Figure 5.1). From 1882 to 1973, the company and its commodity formed the economic backbone of the country (Lal: 1992). For the sugarcane workers, however, the industry, under the management of the CSR, was a constant struggle and a source of political ferment throughout the colony.

From 1882 to the early 1940s, the CSR was the economic juggernaut of the colony, and its de-facto ruler (Lal: 1992, 13). It became accustomed to having its own way in dictating terms to its grower tenants and cane contractors, and in obtaining concessions from the Government. The growers during this period were locked into a relationship that has been described, in the words of A. D. Patel (1905-1969)- a lawyer, as "strongly evocative of the relationship of tycoons and serfs during the medieval age" (Lal: 1992, 125; 1997, xxviii). The company was in strict control of the industry, regulating all aspects of sugar production in the country, and from the company's point of view, the growers were to take whatever was given to them and be thankful for it. The tenancy agreement between the growers and the CSR left the

growers fully at the mercy of the company. They were not allowed to plant vegetables for sustenance purposes on the lands leased from CSR, and were not allowed to keep poultry or cattle without the permission of the company. The CSR could also determine the varieties of cane to be planted; how it was to be tended and how it was to be harvested. Not only did colonial and CSR rule hinder the economic development of the *Girmitiyas* and their descendants, but its efforts to further 'white privilege' were a major causes of racial tension in the country. This did not, however, go well for CSR and colonial rule in the long-term.

5.3.1 Racial Based Strikes of 1920 and 1921

The first major strike by sugarcane growers against the CSR took place in 1921 in the western Viti Levu. The previous year, Indo-Fijian employees of the Public Works Department (PWD) in the central eastern parts of Viti Levu had walked off their jobs (Star: 1920; The Barrier Miner: 1920; Sharma: 1987, 41). The Indo-Fijian PWD employees wanted an increase in their wages which had remained at 2 shillings a day while the wages of the Europeans, Part-Europeans, and Native Fijians had increased since 1914. The costs of Indo-Fijians food items had doubled since 1914 and the workers wanted similar treatment to other ethnic groups.

In the 1921 cane farmers strike, the Indo-Fijian sugarcane farmers' grievances coalesced around several issues (Ali: 1980, 79-80; Moynagh: 1981, 124). On the western side of Viti Levu, the tenants and workers on CSR contracted estates were demanding better wages of 12 shillings a day. They also wanted the CSR to provide them with better working conditions, such as specified working hours, medical and pension benefits, educational facilities for their children, and plots of land for keeping cattle (Lal: 1992, 82). Lal (1992, 80) states that a group of *Girmitiya* Pathans and Punjabis had earlier protested in 1907 and went on a strike in Labasa to protest against the working conditions on the CSR plantations there, but this was quickly brought to control by the Colonial Government and the CSR by removing the leaders of the strike to other parts of the country.

The 1921 strikes were brought to a close by the Colonial Government and the CSR employing Native Fijians who were sourced in groups from various parts of Fiji and employed as constables against the striking Indo-Fijians. The failure of the strike left the farmers with no choice but to continue with their normal lives which

were fraught with difficulties, until the late 1930s and early 1940s when once more issues came to a head.

5.3.2 The Dispute of the 1940s

By the 1930s, the first post-indenture generations of the *Girmitiyas* had started to take up sugarcane farming. They differed from the original *Girmitiya* populations in the sense that they were more assertive and conscious of their labour rights. Around this time, growers were agitated by several problems in their relationship with the CSR, the major one being that they felt disadvantaged by the method of payments. Farmers were paid by the tonne based on the 'pure obtainable cane sugar' (the p.o.c.s. system) with an additional 3 shilling per tonne 'bonus' that could be withdrawn at the company's discretion. The farmers opposed this system of payment and wanted a minimum flat rate of 16 shillings and 6 pence per tonne of cane (Lal: 1992, 126).

The sugar industry workers also complained that the 2 shillings and 2 pence per day that they were getting as wages were insufficient to provide the basic necessities of life for themselves and their families (Lal: 1992, 126). The payment system was forcing both the workers and the growers into poverty and indebtedness. Farmers had to borrow money to pay for their land leases from the CSR, and then borrow more, at exorbitant rates of interest, to meet their social obligations and farming expenses. The issue became acute in the late 1930s when per capita income in the cane regions was declining. The CSR did provide advance payments at 5 percent interests, which was lower than what the money lenders would charge, but only a few farmers were able to access these advances because of the condition that they needed to have standing sugarcane crops on their farms to act as assurance for the company.

Many farmers also felt deprived of income by the Company failing to credit them with the full weight of their harvests, or the full percentage of sugar in the cane (Lal: 1992, 126; 1997; Prasad: 2004). There was no opportunity for them to check the accuracy of the information that the company provided on their harvests, and the Company would not allow growers to check the weight of the cane at the weighbridge, or when the quality of the cane was determined. This caused the

growers to suspect that the Company was profiting at their expense, and they wanted the p.o.c.s system abolished.

In the late 1930s the Company introduced the concept of rotational cultivation of cane. This was implemented for the sound management of soil, but it did nothing for the problems faced by the growers, the main problem being declining incomes (Lal: 1992, 127). Farmers were already faced with debts (Lal: 1992, 82-83); rents had risen and their only hope was to cultivate every piece of land available in the hope of making ends meet. Payments for rent on land without any return rendered their already precarious financial position worse.

None the less, the farmers continued in their efforts to seek justice from the Colonial Government by asking for a commission of inquiry. But the Colonial Government supported the CSRs view that the growers were not faced with financial difficulties. The grower's views now were that if the circumstances did not change, they would have to give up the cultivation of sugarcane and resort to other crops that would provide them with more reasonable income. To their infuriation, the then Governor told a farmer gathering in Lautoka that they:

> could have their sugarcanes rot in the fields…they could shoot their working animals and burn their own houses, so as long as they were careful to burn their own, and not other peoples (Lal: 1992, 129-130).

By this time the growers had also formed two political farmer associations; the Kisan Sangh and the Maha Sangh (Moynagh: 1981, 159; Lal: 1992, 127-128). The Kisan Sangh supported the call for a commission of inquiry but the Maha Sangh did not. The member of the Maha Sang and other farmer groups wanted the matter to be solved under the court of arbitration and not through a commission of inquiry which they thought would simply sweep matters under the carpet.

In July 1943, the Colonial Government changed its view and appointed a commission of inquiry into the issues facing the sugar industry, but the outcome of enquiry did not satisfy the farmers, and especially the leader of the Maha Sangh, A. D. Patel. They were of the view that the Commission had ignored the fact that growers also needed to make a profit from their work in order to meet their social, economic, and religious obligations. The commission of enquiry led to further protests by the growers.

In April 1944, another commission of inquiry headed by Professor C. Y. Shephard took place (Shephard: 1945, 2). It concluded that the cost of living for the farmers had increased by 115 percent between 1939 and 1943 (Lal: 1992, 132-133), whereas the average payment for sugarcane had risen by only 50 percent, and as a result the farmers were deeply in debt (Shephard: 1945, 18-19). But it also stated that the CSR had not been making the profits that were being claimed of it by A. D. Patel. Overall, the report was moderately pro-CSR and this paved the way for the Company to become even more dictatorial and heavy-handed in its approach to the farmers.

5.3.3 The 1959 Strikes against the Europeans and the 1960 Strike against the CSR

In 1959, another series of strikes broke out, involving industrial violence against the European-owned expatriate businesses in Suva (Heartfield: 2002). This came as a shock to the colonial authorities as it questioned a number of assumptions that underpinned the colonial order, particularly as the Natives and Indo-Fijians had joined together in the protest. The Colonial Government had done their best to create separate institutions and structures to segregate the two communities from each other, and this coming together of the two colonised peoples was seen as a serious threat to colonial rule.

In 1960, a strike broke out among growers agitating against the CSR system of payments (Moynagh: 1981, 207). The growers were seeking information about the financial affairs of the sugar industry which were not being shared with them, and were also seeking new cane land tenure contracts. Their basic argument was that they should be getting a fair share of the proceeds, and being paid for it more promptly.

Lal (1997, 135) notes that in 1958 and 1959, the CSR had begun pushing for increased production of cane by introducing new methods of cultivating, managing, and fertilizing land with the assistance of soil scientists, even knowing that there were already limitations on how much sugar could be sold under the existing Commonwealth and International Sugar Agreements. In this circumstance, an increase in sugarcane production could only have a weakening effect on the negotiating powers of the growers in their quest for new contracts.

The company further weakened the growers' position by contracting new cane lorry-operators. The conditions laid down by the CSR were that cane lorry-operators had to make their own roads and farmers had to deliver the sugarcane to the CSR using lorry transportation at their own costs. The CSR had also created a new pool of growers from whom they bought their sugarcane at cheaper prices, and used this new pool of growers as a rival group which could be used against those who were already growing sugarcane in the older areas.

During this time the expansion of cane fields had come to a halt due to expiring land contracts with the CSR, and by the end of 1959, the CSR was offering the growers new contracts. The new contracts were based on tonnage rather than acreage of the sugarcane as had been the case previously, and there were other stiffer conditions laid down in the new contract. A new cane payment formula was introduced providing the growers with 59 percent of the proceeds rather than 62 percent which they had got under the old agreement. The contract also imposed harsher penalties whereby the CSR could reject burnt canes as a result of field fires during the crushing season. The company also reserved the right to reject sugarcane in the event of any interruptions arising from grower strikes, or any other action which was not caused by the company itself (Moynagh: 1981, 204-207).

The CSR was wanting to impose full control over production, and it informed the growers that it was willing to accept only 199,000 tonnes of cane for the 1960 season (Lal: 1992, 175-176). This alerted the main cane grower associations, the Maha Sangh, Kisan Sangh, Vishal Sangh, and the Vanua Levu Farmers Union, to possible fraudulent intentions on the part of the CSR. The situation resulted in the four cane farmer associations combining their resources to collectively bargain for new contracts with the CSR. The outcome of this was the formation of a new farmer association, the 'Federation of Cane Growers Associations'.

With the newly established Federation acting on behalf of the growers, the situation ended in another strike. This time the growers wanted longer leases, 10-year tenancies rather than the short term contracts. They also wanted the right to plant any of the varieties of cane approved by the Company rather than being restricted to a limited number of varieties. They were also seeking a change in the overall payment framework. They wanted 70 percent of the total value of all sugar, molasses and other saleable by-products arising from their produce, and a change

in the timing of payments. They wanted 75 percent of cane payments to be made within a month after harvesting, and 15 percent paid during the crushing season, and the remaining 10 percent paid once the crushing season had ended. The negotiations, however, did not go well, and the CSR came up with even harsher requirements (Lal: 1997, 136).

One of the major requirements of the CSR was that the growers work with the company's overseers and seek prior clarification on how much they were supposed to produce, because the Company was already overstocked with produce. Moreover, the growers were to take their produce to the mills themselves at their own costs, without any assistance from CSR. Further, the CSR would only contract farmers for one to two years. In order to bring financial pressure to bear on the farmers and compel them to sell their produce to CSR under terms dictated by the company, the CSR delayed payments for that season. The growers were furious at these conditions.

Meanwhile, some Native Fijian cane farmers, who at that time made up approximately 5 percent of the total number of growers, had created two new unions of their own - namely the Ba and the Sigatoka Cane Growers' Unions - to represent the indigenous cane farmers (Lal: 1997, 139). This caused the level of tension between growers and CSR to rise. The CSR delayed opening its mills and laid off the bulk of its mill workers. As the days passed, relations between the two sides worsened. By the end of 1960, however, the strike had died out, as the native leaders, who benefitted most from sugarcane lease payments, ordered the commoner natives not to partake in the strike, so as not to betray the 'hands that fed them'.

In the end, the Colonial Government stepped in. The Government's view was that the leaders of the cane grower community were simply playing politics and arguing over issues that were trivial in nature, and as a result, the growers were not harvesting their canes, which was, inturn, delaying the operations of the mills.

The concerns of the growers, however, were otherwise. They saw the CSR as a monopoly which sought only to make as much profit as it could by selling the farmers' produce to the overseas markets. To achieve this, their primary aim was to exploit the farmers' cheap labour as much as possible by making them work under

harsher and harsher conditions. The growers were united in their concerns, even though they had by now broken into smaller groups (Lal: 1997, 145). But, they were also faced with a major challenge as some of the grower leaders had broken away and started to make their own agreements with the CSR (Ali: 1979, 70).

The situation had by now deteriorated to a dangerous level, and cane fields containing 9000 tonnes of CSR sugarcane were set on fire (Moynagh: 1981, 207-208; Lal: 2011, 145). Although there was not enough evidence to prove who lit the fires, most of the evidence pointed towards the frustrated growers. From this time onward, the CSR began to take advantage of the ethnic divisions[10] within the cane farming community and used this as a weapon to dismantle the unity of the growers. It did so with the support of the Native Fijian administration, such as the Chiefs. This further weakened the farmers' unity. Meanwhile, the 'white privileged' Europeans, were demanding severe punishments for the leaders of the strike. Some vitriolic commentary at the time was:

> When a child fails to respond to coercion, there is only one solution, and that is a good hearty wallop [European colonist in the Fiji Times on the 30th of August 1960] (Lal: 1997, 145).
>
> Already there are jackals discernible, prowling hungrily on the edges of Fiji's distorted economy, let us recognise them, and deal with them while we have the opportunity and before we do anything else [The Fiji Times Editorial] (Lal: 1992, 179).
>
> The so-called leaders and their kind should be sent back to where they came from, lock, stock, and barrel [Ravuama Vunivalu: Fifth Member of the Legislative Council] (Dean and Ritova: 1988).

[10] Because the *Girmit* Community in Fiji compose of different ethnicities such as Punjabis, Gujaratis, Biharis, Kolkatans, Mughlas/Persians, Punjabis, Dravidians (Tamil, Kerala Malayalam, Kanada, Telugu) among the rest, the CSR tainted A. D. Patel as the betrayer as he was *Gujarati* leader. Their motive was to play the dirty race politics using his ethnicity/race with the farmers and portray A. D. Patel and the others as fighting for their own political agendas/gains and not for the benefit of the sugarcane farmers. However, today these different races have mixed together due to intermarriages and living together as at that time the number of people were limited, and they would marry each other.

In time, the situation calmed down and the mills reopened with the Government deploying special constables to oversee their operation. The Chiefs, who benefitted most from the land leases, stood by the decisions of the Government in their attempt to maintain law and order in the country. They were worried that the strike would have a negative impact on rental incomes from the lands. This further infuriated the growers. The strike of 1959 to 1960 had cost growers some £850,000-900,000 in lost income (Lal: 1997, 157).

After the strike, the growers' leaders were left with no option but to seek a commission of inquiry. The resulting inquiry, named the Eve Inquiry after its head, Sir Malcolm Trustram Eve (Moynagh: 1981, 209), once again came out ultimately in favour of the CSR (Fiji Sugar Inquiry: 1961; Lal: 1997, 148).

5.3.4 CSR Rule Continues

The position of CSR continued to be supported by the Colonial Government and the Native leaders, and although the Eves Report had granted the growers 10-year land lease contracts, this only meant that the CSR was assured of another 10 years in Fiji. The Eves Report also recommended the formation of a Sugar Advisory Council (SAC) and the Sugar Board (Fiji Sugar Inquiry: 1961, 18-19), which the growers saw as a facade of democracy. The growers distrusted the CSR and argued that the SAC and the Sugar Board would be ineffective, inefficient, and partial to the CSR. It was seen as designed to secure strong representation of the millers and weaker representation of the workers and growers. The growers had no option however but to deal with whatever situation the recommendations of the Eves commission created for them.

Meanwhile, the anti-European industrial disturbance that had taken place in the capital, Suva, where European properties such as cars, shops, and other belongings had been targeted, had resulted in a separate Government commission of inquiry. According to Lal (1992, 168), the incipient Fijian–Indo-Fijian solidarity evident during the strike was beginning to threaten the European economic and political interests in Fiji, and the informal European-Fijian coalition that had developed over the past decade. It was also seen as a threat to the Fijian Chiefly positions, whose rule and powers over the native commoners was perceived to be becoming diluted.

5.3.5 Calls for Decolonization

By now there was a general movement toward decolonization in the world, and calls were being made by the international community for colonial powers to evolve a positive policy for those smaller territories such as Fiji where difficulties might arise in the event of their eventual independence. In this context, July 1960 brought another strike (Ali: 1979, 70-71), this time seeking a new political agenda based on nationalism and self-dependency, which served to accelerate the dismantling of British colonialism in Fiji.

The elections of 1963 following the strike gave birth to a new set of political doctrines which changed the mindset of the people toward self-governance. This was the first time that elections had been held on the basis of universal adult franchise, and the first time the people of Fiji had been given the power to elect their own representatives to the Legislative Council. By the mid-1960s some quasi-political parties had begun to form.

In 1966 another election took place, this time based along party lines. The ethnic backgrounds of the Ministers, however, raised objections. Of the nine Ministers, seven were Europeans, two were Native Fijians, and only one was Indo-Fijian. This was seen as an insult to both the Native and the Indo-Fijian community who together constituted 94 percent of the population while the Europeans represented only 6 percent. To the Indo-Fijian community, in particular, this was like adding salt to their wounds. They were faced with problem after problem in the sugar industry on which they depended for livelihoods, and their relationship with the CSR was once more turning sour. Minimal representation in the Government meant that they had either to 'shape up', or they would be 'shipped out' of the system.

5.3.6 Push for Independence

Ten years after the Eve inquiry - which had supported the views of the CSR - came a major breakthrough for the growers. Lord Denning, Britain's Master of the Rolls, was invited in 1969 to arbitrate over ongoing issues concerning the growers and the Eves Report. Lord Denning was perceived as neutral and provided recommendations and suggestions in favour of the growers (Ali: 1979, 70), stating that the Eves Report had had serious detrimental effects on the growers and the

industry in general. For comprehensive outcomes of the arbitration by Lord Denning, refer (The CSR Company:1970, 1-2).

During these ten years there had been other developments associated with the Government, the sugar industry, and the people of Fiji. The people of Fiji no longer wanted to be regarded as mere anthropological curiosities, and as Lal (1997, 222) very aptly put it, "the Fijian community did not want to be viewed as a community different from the broad community in which they lived". The Indo-Fijians were now pushing for independence, but the natives were still reluctant, as they viewed the colonists as their protectors (Stanley: 1996, 33). The native systems of administration also went through a thorough reform, and the natives by this time had made a number of concessions to the Indo-Fijian community over land and other issues. This was indeed the first move toward a more tolerant and mutually respectful society, and it was crippling the laws and policies made by the European colonial rulers to keep the two communities separate and hinder their social and economic development (MacNaught: 1982, 114).

5.3.7 The End of Colonialism and CSR Rule

The Fijian people were now calling for the Union Jack to be lowered in Fiji. Lal (1992; 2011) argues that the different communities in Fiji together wanted independence even though there were differences between them. The end of the colonial rule was now almost certain. On 9th October 1970, the Union Jack was lowered and on the 10th of October 1970 Fiji was reborn as an independent nation state.

For the CSR, Fiji gaining independence, and the outcomes of the Denning Award, was seen as a direct threat to its commercial viability, its historical domination of the Fijian economy, and the massive political influence it had exercised in Fiji since 1882. In 1973, the CSR closed its operations and sold its sugar interests to the Government of Fiji (Moynagh: 1981, 222-223), which thereafter became the major shareholder in the Fiji sugar industry.

5.4 The Sugar Industry Post CSR and Colonial Rule

After being bought by the Fiji Government, the CSR was renamed the South Pacific Sugar Mills (SPSM) (currently the Fiji Sugar Corporation). In addition to this, there

has been two more Awards since the Denning's Award (Fiji Sugar Corporation: 2003, 318), one in 1979, and one in 1989. The latter, the 'Master Award', is still extant. The provisions of this Awards resulted in disputes concerning the sharing of benefits between the miller and the growers. According to Fiji Sugar Corporation (FSC), the two Awards eroded the position of the miller, as it requires that the growers, after certain deductions, receive 70 percent of the total benefits arising from the sale of sugar, whilst FSC as the miller receives the remaining 30 percent.

The commission of inquiry leading up to the 1989 Master Award had concluded that FSC was demonstrably entitled to 40 percent of the total proceeds after all deductions have been made, but on humanitarian grounds the Commission had awarded the growers 70 percent rather than 60 percent. This deprived FSC of millions of dollars, and as a result, the FSC had incurred one or two periods of financial losses (White: 2003, 289).

In addition to the losses, the FSC had, according to White, experienced excessive mill downtime, industrial disputes in 1998 and 2000, and a harvest boycott by the growers in 1999. The FSC has also been suffering a gradual decrease in production over time as a result of poor harvests linked to a reduction in land under sugarcane cultivation caused by the non-renewal of land leases.

More recent historical developments in Fiji have also seen the heightening of an old problem - the politics of land tenure - something that had begun to affect the sugar industry in the 1920s when the CSR first started to contract growers as small plot holders in order to cater for industry's expansion, but which has now become a major source of contention.

5.5 Part Two: The Politics of Land Tenure

It has been observed that where natural resources are communally owned by an indigenous group with a value system quite different from that according to which natural resources are commodified, arrangements for their utilisation for commodity production often takes a difficult and complex path. This is further complicated when the perception arises that the original owners are not receiving a fair return for allowing access to their resources. This was certainly the case in Fiji.

In the period of 1920-1940, Fiji saw a need for agricultural expansion, and more specifically for more land to be made available for sugar cultivation. Moynagh (1981) states that during this period the sugar industry expanded and was in need of more cane. Accordingly, the CSR began encouraging the development of smallholder farming units in order to increase efficiency and productivity. For the Colonial Government, the only way to meet the demands for sugarcane expansion and other agricultural developments was to seek land from the native landowners. The acquiring of land, however, had to be dealt with in a way that safeguarded the interests of the landlords. By law, native land could be neither bought nor sold, except in exceptional circumstances such as when it was needed by the state for national purposes.

As a solution to this problem, in 1940 the Colonial Government instituted the Native Land Trust Board (NLTB)[11] to manage the native lands for the benefit of the native landowners and the tenants who were to lease the lands. This required the division of native owned lands into smaller plots to be distributed to small landowning units called *mataqali*[12]. The arrangement was supposed to represent the customary land tenure systems that existed before the colonial era, but as Overton (1994) and MacNaught (1982, 9) write, the land tenure system stipulated by the Colonial Government did not represent the customary *iTaukei* norms of land tenure, nor was it well-designed for commercial agriculture. This later had serious implication for both the landlords and the tenants.

The Colonial Government's requirements of *mataqali* registrations were a disaster. The new land tenure system was grafted onto partial and sometimes inaccurate

[11] Prior to 1940, lease arrangements were private matters between landowners and lessees, subject only to approval by the Director of Lands. This arrangement was deemed to be insufficiently certain for lessees.

[12] The British Colonial Government formalised landownership in Fiji recognised communal ownership at the *mataqali* level. Before pre-colonial, resources were owned by different units of indigenous Fijian communities commonly known as *vanua*, *mataqali* or *itokatoka*. The *vanua* is representative of the descendants of common ancestors or ancestral gods living in the same area. Each *vanua* comprise of one of more *yavusa* whose members were agnatically related. A *yavusa* comprised of several *mataqalis* whose members were related to each other and were descendants of their y*avusa's* founder. One or more extended families, *itokatoka* forms a *mataqali*. For more information on *iTaukei* land custom and the structure of society, refer (Roth, G. K. 1973. *Fijian Way of Life,* Melbourne, Oxford University Press.)

interpretations of pre-colonial practice, and modified to allow for agricultural cultivation (Overton: 1994). It was further complicated by informal arrangements (arrangements made between landowners based on mutual trust and through verbal communications) between the communities. The Colonial Government's classification of *mataqali* as the customary land-owning social units was so distant from the reality of *iTaukei* lives that at the 1956 census only 66 percent of the native citizens were able to identify the *mataqali* and *yavusa* to which they belonged.

France (1969) asserts that the social units that successive Colonial Native Land Commissioners declared as exercising indigenous land rights were different from those that originally existed in indigenous Fijian society. The indigenous land rights had gradually been transformed through a number of colonial processes unconnected to Fijian customs. The Colonial Government's native land tenure system sat uneasy upon the actual owners. It harboured inequalities in land distribution and did not take into account important *iTaukei* issues such as land size, land type, and places sacred to particular groups of *iTaukei* people among other things.

Nonetheless, by the late 1960s, many of the lands had been demarcated into different categories of ownership by the Colonial Government. The Legislative Council Paper No. 1 of 1970 (held at the *iTLTB*) identified approximately 82.6 percent of the land in Fiji as being owned under customary law by the indigenous *iTaukei* population, 8 percent to be freehold (privately-owned), and another 8 percent to be Government (Crown) owned (Naidu and Reddy: 2002), (refer Table 5.1).

Categories of ownership	**Area (in acres)**	**% of land area**
1. Fijian customary owned land	3,714,990	82.60
2. Rotuman customary owned land	11,000	0.24
3. Freehold land (other than state freehold)	368,390	8.15
Europeans and part Europeans	*246,242*	*5.5*
Indians	*75,830*	*1.7*
Chinese	*5,081*	*0.1*
Rabi Islanders	*16,950*	*0.4*
Kioa Islanders	*4,600*	*0.1*
Fijians	*7,532*	*0.2*
Other races	*2,688*	*0.06*
4. State freehold lands	161,690	3.57
5. Schedule A lands	149,500	3.31
6. Provisional schedule A lands	40,910	0.90
7. Schedule B lands	75,320	1.67

Table 5.1: Categories of land ownership in Fiji
Source: Naidu and Reddy (2002)

Once the categories of land ownership had been fully established, the Agricultural Landlord and Tenant Ordinance (ALTO) was introduced in 1966 to legislate the leasing of land (Ali: 1979, 71-72; Lal: 1992, 224-225). The legislation gave the tenants a greater degree of security of land tenure under the 'land reserve policy' commonly known as Native Land Trust Act (NLTA)[13] than what they had under the plantation system and short-term contracts for sugarcane production on lands leased from CSR. It was hoped that the ALTO[14] would remove the obstacles facing the development of agriculture in Fiji. The legislation, however, was greatly criticised by the Provincial Councils of Fiji, who were of the view that it favoured the tenants and lacked assurances for the landlords.

Consequently, in 1969 another committee was set up, which tabled its report in 1975. An antecessor of the ALTO, the Agricultural Landlord and Tenants Act (ALTA-1976[15]) was then introduced, to be managed by NLTB. The revised ALTA granted a fixed land lease term of 30 years. For tenancies granted after 1st September 1977, the ALTA provided a minimum lease period of 30 years, while those lessees whose leases were under the ALTO (the great majority of whom had a term of ten years) had their leases extended for another twenty years (Lal et al: 2001, 7).

Overton (1994) notes that provision was also made under ALTA for compensation for developments made to the leased land by the tenants. This allowed the tenants to commit themselves to intensive agriculture whilst they held title to the lands in their names. However, concerted criticism of the ALTA legislation has been made by Lal et al (2001) and Reddy (2003b) who identified two main provisions in the legislation as problematic: the methods for assessing and periodically reviewing the rents levied by the landlords, and the duration of the lease. Similarly, Davies and

[13] Under NLTA, lease arrangements were subjected to greater degree of discretions and rents were dependent on the negotiation powers of the respective parties concerned.

[14] The committee drafting the ALTO recommended that land tenures taken out prior to the introduction of ALTO be extended automatically at the tenant's option except for lands that has fallen into native reserves or where the tenant has not shown good husbandry. It also recommended that all existing leases should be extended automatically for thirty years and a fair rental board created whose task would be to ensure fairness in rental matters.

[15] ALTA was introduced to rationalise the leasing of all land for agricultural purpose. ALTA covers all agricultural land in Fiji except for those holding that are less than one hectare, or where the tenancies are held by members of a registered co-operative society, where the society is the landlord, or where land is situated within a native reserve.

Gallimore (2000) argue that ALTA provided no incentive to the landowners to lease their lands. These three immediate consequences of ALTA are dealt with separately below.

5.5.1 *Methods for Assessing and Periodically Reviewing the Rents levied by the Landlords*

Under ALTA, the landlord is restricted to a land rental charge of 6 percent of the Unimproved Capital Value (UCV)[16] of the land. Lal et al (2001) and Reddy (2003b) claim that the basis for the 6 percent rate remains vague, although it was reflective of the market interest rate at the time the legislation was enacted. Similarly, the theoretical basis for the calculation of UCV also remained unclear.

The UCV has mostly been calculated on the basis of previous sales of freehold lands, state-owned leases, and native leases. In light of the non-renewal of land leases, ALTA legislation states that once the leases expire, tenants are to be compensated with a sum equivalent to the value of improvements carried out. These improvements include buildings, fences, drainage works, roads and crops planted by the farmers.

Under the ALTA, the farmers leasing lands pay a levy to the NLTB who then transfer it to the actual owners of the lands. One issue that has received less attention is the informal 'levy' or 'rent' that is paid by the lease tenants outside legally binding agreements directly to the landowners or the *mataqali* out of fear of not having their leases renewed upon expiry. I coin the term 'leaseophobia' for such fear. As part of this fear, the 'levy' and 'rent' paid outside of legal arrangements include things such as money, cattle, and food that is given to the landowners of the *mataqali* to maintain a good relationship with them.

While maintaining a good relationship with the landowner is important, renewal of land leases under ALTA still remains solely dependent on the landlord. This means that a sugarcane farmer having a 30-year lease period can give a number of items

[16] UCV is administratively determined according to the agricultural potential of a particular land mass. It is determined by Government appointed committee of valuers consisting of a four land valuers, a private land valuer, an employee of the *iTLTB*, and a professional in agriculture having appropriate experience, knowledge or qualifications in agriculture.

over that time to maintain a good relationship, but when the lease expires, there is still no guarantee that it will be renewed by the landlord. The emotional stress for these farmers and their families of the threat of non-renewal of land leases is not something that has been well researched. In fact, there remains a wide window of opportunity to research some of the sensitive issues such as 'leaseophobia' that sugarcane growers are confronted with and its impacts on farmers and their families.

5.5.2 *Duration of the Lease*

According to Advameg (2016), as of 1993, only 9.9 percent of the total agricultural land in Fiji was arable, with most of it in native hands or leased to farmers of Indian descents (both *Girmitiya* and others) who produced 90 percent of Fiji's sugarcane (refer Table 5.2).

As these leases expire and the land is returned to its indigenous owners, major disruptions in sugarcane production are expected.

Use	Fijian (ha)	Fijians of Indian descent (ha)	Others (ha)	Total (ha)
Agriculture	68,327	107,126	25,291	200,744
Residential	344	1,021	302	1,667
Commercial	10	124	353	73,745
Reserve	54,953	103	18,689	516,376
Other	1,292	305	514,779	516,376
Total	**124,926**	**108,679**	**559,414**	**793,019**

Table 5.2: Native leases by 'race' and land use classification
Source: Naidu and Reddy (2001)

The 1996 census showed that there were some 12,500 farmers growing cane on over 60,000 hectares of native owned land leased from native communities (Lal et al: 2001, 1). Non-indigenous ethnic communities, including Fijians of Indian descent, made up more than 80 percent of the sugarcane growers who were, and still are, almost entirely dependent on native communities for accessing land and other resources such as rivers, forest, creeks and marine ecosystems that run on or adjacent to their leased land. Land use statistics indicate that out of the 97,046 hectares of land under cane in Fiji, 63 percent was leased from indigenous Fijians who own about 1.8 million hectares altogether, amounting to 83 percent of the total land of Fiji.

5.5.2.1 Expiry of Land Leases in 1997 and its Consequences

Since 1997 land tenure has been a delicate topic in Fiji. The issue took on a new dimension when the agricultural leases on native land issued under the ALTA-1976 and ALTO legislations began to expire. While some leases were renewed between 1997 and 2002, the majority of them were not, and the land was returned to its native landowners. This is of particular concern to the sugar industry as large portions of these lands are used for sugarcane production.

A project by Naidu and Reddy (2002) canvassed another series of the implication that arises out of the expiry of land tenure for the sugarcane farmers. They conclude that most farmers on native leaseholds see a bleak future in cane farming and are now seeking other alternatives as a result of diminishing sense of security from ALTA. On the other hand, they noted that one of the reasons for the reluctance of landowners to renew expiring land leases was that the communal landowners felt that they had not received their fair share of income and therefore wished to utilise the land themselves.

Some other landowners have also expressed their displeasure at what they see as poor land use practices of the tenants on their landholdings. For instance, the burning of standing cane in the fields has been criticised by some of the landlords. They have expressed their dissatisfaction on how the lands continue to be mismanaged by the tenants (Asafu-Adjaye: 2008).

Since the 1997, the non-renewal of leases, whether it be a communal decision by the native landowners or the decision of their Chiefs, has been fuelled by the then NLTB and its management team. The leaders of NLTB wanted sugarcane farmers, who were predominantly Indo-Fijians, to be automatically pushed out of their farms by the non-renewal of the land leases. In 1999, the Fiji Government headed by the Prime Minister Mahendra Chaudhary had put up several propositions to the NLTB in their efforts to deal with the expiry of land leases, which included the following:

1. That ALTA should remain as the governing law covering all agricultural leases;
2. That ALTA should, however, be amended to make it more equitable;
3. That such amendments be made to accommodate the following:

(a) that a minimum term of 30 years be retained; however, an amendment is to be made such that on the 25th year, and on renewal, the lease is to be extended for a further 30 years;
(b) that land used for intensive commercial agriculture, such as piggery, poultry, egg production, bee keeping and hydroponics, etc. be excluded from the ambit of ALTA;
(c) that the rental system be based on up to 10 percent UCV;
(d) that the charging of premiums on the granting of new leases and any renewal thereafter be allowed under ALTA, and the amount is to be determined by the committee of valuers;
(e) full compensation for improvements at market value be paid in accordance with agreed Schedule of Improvements; and
(f) any other amendments proposed by Cyril Farrows (consultant) in his submission to the previous Government.

4. That the NLTB should be solely and directly responsible for consulting the landowning units on the issue of new leases, or extension of existing leases.

These propositions met with a negative response from the NLTB which threatened that:

> any attempt by the Government to implement the above proposition will demonstrate the Government's insensitivity towards the realities of the landowners and tenants, particularly within the sugarcane belt…[and]…the effects this will have on the sugar industry and Fiji's economy. We say this because many more tenants will be subjected to eviction from the sugarcane belt as is the current practice (Lal and Reddy: 2003; Native Land Trust Board: 1999).

In rejecting the propositions of the Government, the NLTB recommended the following:

1. That the Government, political party leaders, and all other actors should explicitly and publicly acknowledge that native land (including Crown Schedule A and B lands) is the exclusive property of the native landowners, and accordingly the NLTB in consultation with the landowners alone should have the right to determine when, how or if their land is to be leased;

2. That the Government, political party leaders, and all other actors should explicitly and publicly acknowledge the debt owed by both the nation and the tenant communities to the landowners for their sacrifice in having surrendered the use of their land under ALTO and ALTA at less than commercial rates of returns, and further publicly acknowledge the right of the landowners to receive a fair and commercially determined rate of return on lands they will allow for leasing;

3. That the Government expeditiously put in place amendments to the current provisions of ALTA to allow new agricultural leases over native land to be outside the ambit of ALTA. That at the same time, NLTB publicly announces its assurance to the tenant community that those whose leased land will not be required by the landowner for their use, will be offered rolling leases under NLTA. That the Government and political party leaders explicitly and publicly acknowledge that Fijians have traditional and customary ownership rights;

4. That NLTB publicly announce that, together with the Government and in consultation with the native landowners, it will make available native land for resettlement. That the Government and political party leaders explicitly and publicly announce their full support, both in terms of resources and finance, to NLTB to enable it to make available land for resettlement both in rural, urban and peri-urban areas;

5. That the Government and political party leaders explicitly and publicly acknowledge that natives have traditional and customary ownership rights over the land below the high water mark referred to as their *iQoliqoli* and that the natives should be assured that Bills shall be introduced conferring such rights to the Fijian owners;

6. That the Government and political party leaders explicitly and publicly acknowledge that native land previously acquired by the Government for public purposes, and currently used for purposes other than for public purposes, be immediately returned to the original owners (Naidu and Reddy: 2002).

Whether this was a reflection of the collective view of the landlords, or whether the leaders of the NLTB had made its own decisions still remain unclear to many academics. To counter the land crisis facing the sugar industry, the Chaudhry-led Government during the late 1990s and early 2000 initiated a process of negotiations to reach a mutually beneficial agreement between land owners and lessees. But in 2000 the Speight administered coup overturned the Government, and the negotiations were placed in limbo.

5.5.3 *No Incentive to the Landowners to Lease their Lands*

Barbalich (2009) argues that Fiji's authoritarian political institutions, such as the NLTB, established under colonial rule, have been sustained since independence by forces in the international economy. He argues that such forces have been essential in maintaining the economic, social and political dominance of the indigenous chiefly elite over the native commoner society. Additionally, Fiji's principal export, sugar, during the colonial period, provided chiefs with sufficient patronage over resources to retain their control over their society through electoral politics, or in the event of undesirable electoral outcomes, over the armed opposition. Along with these considerations, the issue of social status and hierarchy has also received criticism.

This has been explained by Naidu and Reddy (2002) for the Fijian context:

> this complexity of land tenure is further exacerbated when resource owners are culturally and physically different from each other and tend to utilise and gain from the same resources that are very dear to them. In the case of land, when the land use is entrusted on to a bureaucratic institution such as the statutory authorities then, besides the interests of the landowners and tenants, other institutional politics and individual bureaucrats' interests also affect the tenure agreements (p3).

For instance, in reality, the chiefs controlled the land tenure systems, and through their setting and receipt of land rents, they have been the principal beneficiaries of Fiji's sugar exports. As far as the institutional arrangements for the distribution of revenue were concerned, roughly only half of the total revenue collected by the NLTB was handed to the ordinary commoners of the *mataqali* (Kurer: 2001).

This caused many indigenous communities to remain adamant about non-renewing cane farm leases which in turn placed the grower tenants in a very weak position. They were left without options and remained entirely at the mercy of their landlords. The situation became more disordered when an elite group of people such as political leaders, merchants, and chiefs tended to prey on the many opportunities arising out of the desperate situations of the cane growers.

To make the situation worse, straight after the Speight coup and during the Qarase Government, the NLTB moved out of the ambits of its core function, which was to ensure that land was available for economic development while at the same time safeguard the interests of the landlords, and began to politicize the issue of land tenure. The leaders of NLTB had started to speculate to the landlords that lands leased would be lost to tenants and that there was no possible way to reverse this once leased out (Fiji High Court: 2008).

Thereafter, the Qarase-government, together with the Great Council of Chiefs (GCC), in the views of many people, and especially in the eyes of the Republic of Fiji Military Forces (RFMF), had become controversial and extremist in nature. Instead of focusing on solving the many issues surrounding the nation and its development, the Qarase Government had become 'a dynasty of controversial bills and racial conflict' while the GCC turned out to be 'a platform for venting their personal vendetta'. The chiefs had been increasingly turning their interests away from the affairs of the village.

> The RFMFs standpoint on the Qarase Government was that the army wanted the withdrawal of 3 Bills, namely, the Reconciliation Tolerance and Unity Bill, the *iQoliqoli* Bill and the Land Tribunal Bill that was proposed by the Qarase Government at that time. It stated the bills were unconstitutional, controversial and extremist in nature, and would *"not bring forth peace and stability that we seek as a young nation"*. It was understood that such bills would potentially create conflicts among the indigenous population (Fiji High Court: 2008).

For the RFMF, the bills supported by the chiefs were a quest to buy votes for political expediency and supremacy. Alongside this, the RFMF also sought the removal of the commercial arm of the NLTB. The RFMF wanted the NLTB to

focus on its core functions and secure the medium and long term stability of land leases that the tenants wanted, in particular, the sugarcane growers. Having failed to influence the standpoints of the Qarase Government, in 2006, Commodore Frank Bainimarama overthrew it, and in the process he expelled the GCC.

Whether the aim of the Qarase-government was returning the lands back into the hands of the communal owners, or his Government's way of managing the politics of race in Fiji, it is now clear that to the Bainimarama-government farmers leaving the sugar industry meant a direct threat to the quarter of the Fijian population that survives on this industry, the loss of a substantial percentage of national GDP arising from the export of sugar, and a loss of knowledge of sugarcane farming methods and practices and modes of increasing sugar production levels.

Although disagreements over long-term extensions of land leases have led to a lack of investments in the sugar industry, today the problems of the industry are more than just the problem of land tenure; they are multifaceted. The sugar industry remains important in Fiji, not only for the many developments it finances but also because of the many people whose livelihoods are dependent on it – particularly the livelihoods of the descendants of the *Girmitiyas* whose hard work laid the foundation of the industry. A full analysis of these problems will be presented in Chapter Eight.

5.6 Chapter Summary

This chapter provides a brief history and background information on the sugar industry since the indenture period in 1879 up to 2014. It provides a perspective on the growers and their lives under the colonial and CSR rule, and under successive Governments since independence in 1970. It also discussed the origins of the problems of land tenure. In the following chapter, a description will be given of the everyday situation of sugarcane farming households in Fiji today.

Chapter 6 The Smallholder Sugarcane Farmer in Fiji

6.1 Introduction

This chapter provides a window onto the everyday situation of the 29 cane farmer households who participated in the household livelihood survey, participant observation and the agroecosystem analysis phases of this research. The first section provides a brief ethnographic portrait of the *Girmitiya* community of which the smallholder sugarcane farmers are a major part. This is followed by sections on their socio-economic situation, residential and housing status, agronomic situations, household division of labour, organization of sugarcane growing, historical memories and contemporary concerns. A chapter summary forms the final section.

6.2 A Brief Ethnographic Portrait

The majority of smallholder sugarcane farmers in Fiji have their origin in the *Girmit* indenture systems, under which their ancestors worked as indenture labourers, in the cane fields of Fiji from the early 1880s until the 1920s. Many critics of the indenture system, such as Ghoshal (2014), equate it to the period of 'slavery'[17] and the 'indentured labourers' as 'slaves', but I do not accept this description. The labourers who came to Fiji during the indenture period took up the occupation 'voluntarily' with legal binding agreements written in a language they understood (Prasad: 1974, 32-33; Lal: 2004, 6). It was later that the British colonial government and the Australian CSR Company turned the system into one of 'slavery' by breaching the conditions[18] of their workers' employment.

Today, the *Girmit* communities and their descendants are found living mostly in the western belt of Viti Levu and on the northern island of Vanua Levu, and are different from the rest of the Indo-Fijian community in Fiji, who came as free settlers, traders, cotton and copra plantation workers, and visitors. The majority of *Girmitiya* cane-farmers work on land leased from *iTaukei* landowners. Only some own freehold land. The recent up-take of cane farming by the *iTaukei* farmers has

[17] The British turned to indentured labour system after the slave trade was officially abolished in 1807.

[18] Conditions of employment whether in writing, or verbally promised, or implied to the *Girmitiyas*.

seen many *iTaukei* settling in the cane belts of Fiji. *iTaukei* farmers are mostly land owners but some also lease land from other *iTaukei*. The majority of both the *Girmitiya and iTaukei* cane-farming households are free settlers, not part of any village or community, while others are found living in communities or villages. The systems in the cane belts force people to rely on their own resources and on each other for maintaining their social and cultural welfare.

The present day descendants of the *Girmit* sugarcane farming community, whether living in Fiji or overseas, speak a common language called Fiji Bāt/Fiji Hindi/Hindustani - a language different from that spoken in India. It is a mixture of words derived from Urdu, Hindi, Sanskrit, Arabic, Tamil, Telugu, Malayalam, Bhojpuri, Bangla/Bengali, *iTaukei*, Persian, Punjabi, Gujarati, Odia, Telugu, Kanada, Kashmiri, Marathi, Kutchi and English among others (Gounder: 2011, 7; Lewis et al: 2016). In spoken Fiji Bāt, there is no differentiation of gender, and the language uses modulation of speech and tones. It is a distinct variety in which modulation of speech and tone can change the entire meaning of what is being conveyed, when compared to the Hindi and Urdu language spoken in mainland India and Pakistan respectively (refer Moag: 1979, 112-135).

The formation of the community is due to a limited number of people of different ages, social, economic and religious backgrounds, with contrasting expectations of life, meeting and mingling with each other and assimilating into one common identity through intermarriages since the indenture days of Fiji. The *Girmit* culture has evolved in relative isolation, although it has been refined and adapted through its interplay with the western and *iTaukei* cultures, and now exists even outside of Fiji as a result of the *Girmitiya* diaspora, where it retains its distinctive character (refer Prasad: 2004; Prasad: 2015a).

For their part, the *iTaukei* speak different dialects depending on their origins and heritage from different parts of the country. When they speak to someone from another part of the country, however, they speak a common Bauan dialect of the *iTaukei* language. Experience shows that most people in the western and northern parts of Fiji are fluent in both the Fiji Bāt and the Bauan dialect. This is indicative of the fact that plantation life generates new forms of culture. Recent changes are paving the way to greater individualism, income independence, and educational and occupational mobility - in particular for the younger generations.

Nonetheless, the sugarcane farming communities generally maintain extended familial ties whereby people live and work together, sleep under the same roof, eat together and share the same amenities. Culture and religion are the basis of identity in the sugarcane farming community of Fiji and everyone in the household is well acquainted with their roles and obligations. However, some people do marry outside their ethnic or religious groups.

The local born are different in physical appearance, in their thinking and worldly views, and in their social behaviours compared to their *Girmit* ancestors (Moynagh: 1981; Lal: 1992; 2004; Gounder: 2011; Lal: 2011). The current populations have a wider range of friendships among different ethnic and religious groups and enjoy a more relaxed form of lifestyles. Apart from the planting of sugarcane, many farmers also engage in other forms of income generating and subsistence activities.

Politics in the community is inclusive of religious (Hinduism versus Christianity versus Islam), ethnic (Fijians of Indian descent versus *iTaukei* versus Fijians of other descents), class (Rich versus Poor, Power/Strong versus Incapacity/Weak), and 'racial' (Fair versus Dark) tensions, and given such tensions, old habits are discarded to make room for new ones and to make way for creative responses to the challenges of survival in the cane belts of Fiji.

6.3 The Socio-economic Situation

In her ethnographic study of smallholder sugarcane farming households in 1996-1997, Carswell (2003, 135; 2000) found that the smallholder sugarcane farming households on the island of Vanua Levu focused mainly on the system of 'hearth', whereby each household operated their own kitchens, although resources may also be shared between households, and members of one household may eat in households of others. In her study, the system of 'hearth' determined the management, production and distribution of resources in the smallholder sugarcane households.

Carswell found that smallholder sugarcane farming household situations benefitted the sugar industry and argued that the production of sugarcane was interdependent with the 'other socio-economic processes' on smallholdings, as the households cannot survive on the incomes from sugar alone (Carswell: 2003, 143). She provides only limited analysis of the differences in socio-economic status between

smallholder sugarcane growers, focusing mainly on differentiation in gender and generational relations on Vanua Levu. The finding of the present study presented below add to Carswell's study by providing an analysis of not all, but some of the current 'other socio-economic processes' that she talks about.

6.3.1 Ethnic and Religious Identity

Out of the 29 farming households included in this study, 25 of them were descendants of the *Girmitiya* community of Fiji, while four were of *iTaukei* heritage. Twenty *Girmitiya* households followed the Hindu faith and four were following Islam. Four of the *iTaukei* and one of the *Girmitiya* households were followers of Christianity.

6.3.2 *Household Situation*

The majority of the households in the cane belts of Fiji still live as extended families. 61 percent of the household's understudy during the research were living as extended families, with the remainder living as nuclear families (refer Table 6.1).

Families living together as household members was an integral feature of research participants' lives with the majority of households also relying on their close kinship links for assisting in farm activities. A famous saying among the *Girmit* cane farming community is that *'a family that cooks together stays together forever'*. And of the 82 percent of the families who were living together, 77.4 percent of them were cooking together as well.

> Being part of a family was very important in all the households where I stayed. The mothers woke up as early as 4am and prepared meals for their children going to school and their husbands going either to the cane fields or to work. By 6am, she had already wrapped the lunches and ensured that her children's uniforms were ironed and ready before they woke up. If grandparents were living in the same household, they would be awake by 6am as well and help in preparing the children for school (Field Notes: 2015).

During the evenings, members of the households would gather around the table at dinnertime and discuss how they had spent their day. It was common for the elders to be served first, followed by the children, and dinner would not start without a prayer.

Regions:		**Sigatoka-Nadi**	**Lautoka-Ba**	**Tavua-Rakiraki**	**Labasa-Seaqaqa**	**Total**
Total household surveyed		6	11	8	4	29
Situations:						
Number of houses owned on the lands	Minimum	1	1	1	1	1
	Maximum	1	3	4	1	2
	Average	1	2	3	1	2
Family type (%)	Nuclear	33.3	9	37.5	75	38.7
	Extended	66.7	91	62.5	25	61.3
Family farming together (%)	Yes	67	64	87.5	75	73.4
	No	33	36	12.5	25	26.6
Family cooking together (%)	Yes	83	64	87.5	75	77.4
	No	17	36	0	25	19.5
	At times	0	0	12.5	0	3.1
Family living together (%)	Yes	83	82	88.5	75	82
	No	17	18	12.5	25	18
Household Head (%)	Male	100	100	75	100	93.75
	Female	0	0	25	0	6.25

Table 6.1: Household situations

It is common for the males to be the household head in Fiji, and 93.75 percent of the households surveyed stated that males were the household heads; usually the grandfather or the father of the household. From my observations, they were responsible for making all the decisions concerning the household. Authority shifted to the grandmother or mother, however, if the male heads had died or were no longer living with the family. I noted a high level of respect among the young generations for their parents and the other elders of their immediate and the extended families.

If the eldest sibling in the household was a male, he has many responsibilities bestowed upon him. He is expected to help in the farm, look after the animals, ensure that the other siblings in the household are doing well, and when the parents grow old, it is his responsibility to look after them, though they may also be supported in this by the other siblings.

It is also common for the household to own and occupy at least one house on their farmlands. If there were other houses owned by the farmers, they were utilized either by the family of the contracted labourers, used for storage, or are utilised by other relatives, usually the farmer's siblings.

In the households, women most of the time maintained a hierarchical division of labour based on age and affinal relationships. For instance, if the grandmother is present, she is considered most senior, followed by her daughter-in-law (i.e., her son's wife). Then comes the granddaughter-in-law (i.e., the wife of her grandson). She is lowest in the hierarchy. Daughters are considered the "pride of the family" and are pampered. Daughters-in-law, regardless of their ranking in the hierarchy of daughters-in-law, would not talk much when certain males are present (i.e., grandfather, grandfathers brother, husbands elder brother, or an outside male not considered part of the family). This is a sign of 'respect' for patriarchal values of the household.

The grandmother is responsible for overseeing all domestic tasks and ensuring that they are done correctly. If they see something not being done correctly, they will point this out. It will then become the responsibility of her daughter-in-law to resolve it. The grandmother's daughter-in-law would then ask *her* daughter-in- law to fix it.

During the fieldwork, it was observed that mothers-in-law usually decided on all the household chores for the day. Daughters-in-law would consult their mothers-in-law about washing of clothes, tidying the house, washing of dishes, cooking of food, etc. and at times, the mother-in-law would assist them with these chores. Grandparents, especially the grandmothers would spend most of their time looking after their grandchildren. Even if the grandchildren were disobedient or made mistakes, and instead of correcting them, the grandparents would take their grandchildren's side. The grandchildren were seen to be held dear by their grandparents and were often spoilt by them.

In the household, if sons-in-law were present, the family would be careful of their choice of words, behaviour, attitudes, and actions. It was noted that sons-in-law had a higher status than the sons, even if they were younger than them. It was seen that the son-in-law was pampered and respected more than the household's sons.

Daughters of the household are also expected to assist in household chores, but their contribution was usually minimal, as once there is a daughter-in-law in the household, it is expected that she will do more tasks than the daughter of the household. It is the opposite, however, for sons, who are expected to do more tasks than the sons-in-law.

Arguments and disagreements within the household were common between sons and sons-in-law, daughters and daughters-in-law, daughters-in-law and mothers-in-law, and between sons-in-law and father-in-law. However, most commonly they were between daughter-in-law and mother-in-law. For them, there were always difference in opinions which would end up in heated arguments. In most cases, the mother-in-law wanted everything to be done her way. When members of the daughter-in-law's family visited, however, the household would cook many different types of dishes and would try to make their visit as comfortable as possible; (refer Carswell (2000) for a full description and analysis of extended household relations in the sugarcane fields of Fiji).

6.3.3 *Monthly Household Expenditure (Average)*

The regular cane growing households spend somewhere around FJ$400-700 a month on basic necessities. The bulk of the household expenditure consists of payments made for utility usage, important food items such as flour, sugar and rice, and fuel. The average amounts to FJ$570 per month for the items described in Table 6.2. It is important to note, however, that in different regions, household needs and wants differ.

Expenditure on household items (monthly)	**Sigatoka-Nadi**	**Lautoka-Ba**	**Tavua-Rakiraki**	**Labasa-Seaqaqa**	**Total Average (FJ$)**
Salt	4.07	3.45	3.12	3.5	3.54
Butter	7.33	9.96	7.8	8.5	8.40
Bread	7.33	11.73	8.75	8.5	9.10
Sugar	23.83	16.82	21.11	18.75	20.12
Oil/fat	26.00	28.45	18.25	15.75	22.11
Water Bills	13.33	17.91	33.33	26.5	22.80
Alcohol and Tobacco	35.83	30.91	10	15.5	23.10
Snacks and drinks	21.67	37.27	19	18.25	24.05
Toiletries	25.00	33.36	21	17.5	24.22
Fast food items	28.33	51.82	21.67	10	27.95
Flour	34.50	34.73	29.86	28.75	31.96
Fuel (cooking)	26.83	46.95	29.13	26.25	32.29

Table 6.2: Average monthly expenditure on household items

Table 6.2 Continues

Rice	33.58	41.16	25.62	37.5	34.47
Fruits and Vegetables	46.67	55.91	24	13.75	35.10
Dairy Products	53.43	32.55	25.14	40	37.78
Electricity Bills	47.50	51.82	29.71	36.75	41.45
Meat and poultry	76.67	81.82	33.33	95	71.71
Fuel (transport)	117.83	118.18	43.75	120	99.94
Total (FJ$)	***629.73***	***704.8***	***404.57***	***540.75***	**570**
Annually (FJ$)	**7556.76**	**8457.60**	**4854.84**	**6489**	**6840**

A quick analysis shows that farmers in the Lautoka-Ba region spend the most, followed by the Sigatoka-Nadi, Labasa-Seaqaqa and Tavua-Rakiraki regions respectively. As per my observations, this higher expenditure is most likely because people in the Lautoka-Ba and Sigatoka-Nadi regions live a more urban lifestyle. People there live in closer contact with the bigger towns with larger local economies than those found in the other cane belts.

> My observations were that members of households in the Lautoka-Ba and Sigatoka-Nadi regions made regular visits to shops and the towns to buy things which they required. Many of them would also buy necessities on their way back from work. Some members of the households would also make trips, if not once a week, at-least once a fortnight to the cinemas, restaurants, and to the party and tourist spots. Saturday is always reserved as a shopping day when usually the females of the household would go to the towns and cities to buy supplies that were about to run-out in the house (Field Notes: 2015).

It was also noted that those households who sell farm crops such as the vegetables and fruits flock to the nearby markets on Thursdays, Fridays and Saturdays to sell such produce. Many of household also sell by the side of National Highways - Kings and Queens Highway (refer Figures 6.1 and 6.2).

Figure 6.1: Roadside stall for selling produce
Source: Author

Figure 6.2: Selling from home along the highway
Source: Author

Proximity to towns is the reason why households in the Sigatoka-Nadi and Lautoka-Ba regions have higher expenditures compared to the Labasa-Seaqaqa and the Tavua-Rakiraki cane belt regions which are less urbanized and known for their 'backwardness'. Amenities such as cinemas, tourist spots, good restaurants are absent in these two regions and the people have a slower more moderate lifestyle.

Generally speaking, in all four regions, Sundays were mostly spent collecting root crops, wild fruits, firewood, and making bush/plantation visits. Members of the households roam around in the settlements or go to nearby villages to buy vegetables and exchange goods. Males usually formed gangs in the evening around the Kava bowl, gossiped, and talked about their farms and the sugarcane. Sunday was the most important day of the week for relaxing and for exchanging conversation. Households that followed Christianity attended nearby churches.

In the Tavua-Rakiraki and Labasa-Seaqaqa regions, households and their farms are in general scattered and remain isolated from the urban centres making regular contact with the urban centres difficult. Accessibility is limited if the family does not own a vehicle, as there is very limited public transport.

6.3.4 Other Important Expenditures (Annual)

The regional disparity in expenditure is reversed when other important expenditures are scrutinized. In the Tavua-Rakiraki region, household expenditures on other important items of Fiji takes a higher toll on household income than in other cane belts. Tavua-Rakiraki is known for its more rural and traditional lifestyle and it

allocates a higher position for its expenditures to social events. It also has higher expenditure for the procurement of implements, medical expenses, education expenses, and farm inputs among other things (refer Table 6.3).

Items (Average)	**Sigatoka-Nadi**	**Lautoka-Ba**	**Tavua-Rakiraki**	**Labasa-Seaqaqa**	**Average Expenditure (FJ$)**
Construction materials	460	164	994	275	473
Repayment of debt	333	861	1500	1225	980
Gifts/ Remittance	95	414	583	50	286
Medical Expenses, health care	160	454	450	225	322
Clothing, shoes (except for those required for school)	585	541	410	450	497
Education (books, school fees, uniform, transportation, shoes, school bags, etc.)	792	550	1070	638	763
All equipment and tools (excluding agricultural tools and equipment)	175	1355	1065	73	667
Social events and gathering (funeral, parties, year-end celebrations, weddings, etc.)	1153	1577	2093	675	1375
Cost of inputs for raising crops including agricultural equipment, tools and labour	1253	1300	3067	2445	2016
Cost of raising livestock including the cost of buying livestock, feed and labour	484	811	100	225	405
Total (FJ$)	***5490***	***8027***	***11332***	***6281***	**7783**

Table 6.3: Other important annual expenditure

The reason for higher expenditure on social events in the Tavua-Rakiraki region is that people in this region are extremely close-knit. Family bonding is strong and people contribute heftily to social events. But there is a common understanding between the relatives and communities that such contributions will be reciprocated when there is a social event happening in their family.

The positions of family members in the family genealogy and the role they play during social events also has an effect on expenditure. For example, in the *Girmitiya* Fiji Muslim communities, the maternal uncles mostly have to take on the whole burden of organizing the venues for the wedding of their nieces and nephews, and are expected to make monetary contributions more than the paternal uncles. The paternal uncles only take care of minor logistics such as the cooking of food during the event and ensuring that things are running smoothly. Another example, with regard to funerals, in the *iTaukei* community, the maternal family ties of the deceased play an important role. They have to make huge contributions in both cash and kind.

Furthermore, because regions such as Tavua-Rakiraki have smaller towns and a relatively limited number of shops, the items sold there tend to be higher priced compared to larger towns such as Lautoka and Nadi where the price of consumer goods fluctuate due to competition among the sellers. The high level of expenditure on education arises from high prices for school uniforms and stationery.

All regions are faced with high expenditures on farm inputs such as fertilisers, herbicides and pesticides, and agricultural tools and equipment for working on the farm. The average money spent on these inputs is more than FJ$2000 annually.

The early, mid and late months of the year were found to be higher in expenses for farming households (refer Figure 6.3). The high expenses at the beginning of the year were due to the commencement of the school year when new schooling materials had to be bought for the children.

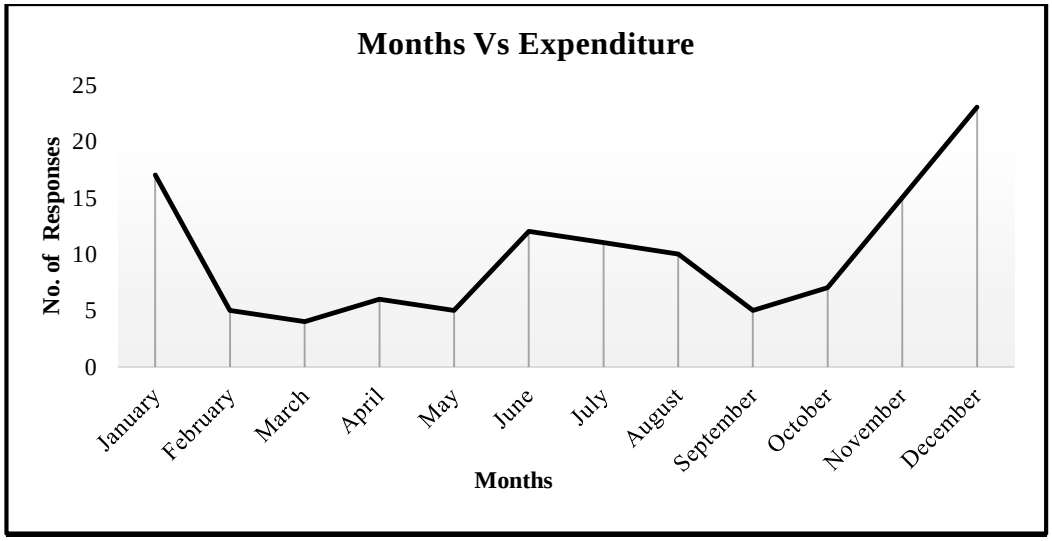

Figure 6.3: Monthly fluctuation in expenditure

The expenses rise again in the middle of the year when the cane harvesting season begins, the new cane planting begins, payments have to be made to the labourers in order to secure them for the season, and the farmers have to prepare themselves to maintain these labourers throughout the harvesting period. This includes preparing their accommodation, food, drinks, transportation and salary among other things that form part of the labour contract. The end of the year is usually characterised by high expenses because of functions associated with festivities such as Diwali and Christmas. It is also the wedding season.

6.3.5 *Social Connections*

The cane farmers in Fiji live in villages or in scattered farming households that are the basis of their social grouping and activities. Their household economy is tied to producing for a commercial sugar market. However, they also produce vegetables and root crops for self-consumption, and access wild crops for subsistence purposes (refer Carswell: 2000; Carswell: 2003, 137).

Survey and observational evidence obtained throughout this research indicates that as well as being commercial producers, the sugarcane farming households also have intricate exchange arrangements with their relatives, both locally and internationally (refer Table 6.4). Such arrangements ensure that resources are efficiently used and that people are looked after in times of need. Peoples' basic necessities are supplied through their own resources and their kin-networks. Communal ownership of assets also acts as a safety net.

Regions		Sigatoka-Nadi	Lautoka-Ba	Tavua-Rakiraki	Labasa-Seaqaqa
Number of Households		6	11	8	4
Relatives in the village	Yes	6	9	8	2
	No	0	2	0	2
Do they assist each other with farm and or other activity?	Yes	3	8	5	2
	No	3	3	3	0
Do they give or receive food from these relatives?	Yes	1	6	4	2
	No	5	5	4	0
Do they give or receive cash from these relatives?	Yes	0	3	3	2
	No	6	8	5	0
Have such forms of mutual aid increased/ decreased or stayed the same over time?	Decreased	1	4	3	1
	Increased	0	2	1	0
	Stayed the same	1	1	2	1
	N/A	3	4	2	2
	Fluctuates	1	0	0	0
Does the household have relatives outside the village?	Yes	5	11	7	3
	No	1	0	1	1
Do they assist each other with farm and/ or other activity?	Yes	3	8	4	3
	No	3	3	0	0
	N/A	0	0	1	1
Do they give or receive food from these relatives?	Yes	1	6	3	3
	No	5	5	4	0
	N/A	0	0	1	1
Do they give or receive cash from these relatives?	Yes	0	3	2	3
	No	6	8	5	0
	N/A	0	0	1	1
Have such forms of mutual aid increased/ decreased or stayed the same over time?	Increased	0	2	2	1
	Decreased	1	4	3	1
	Stayed the same	1	1	2	1
	N/A	3	4	1	1
	Fluctuates	1	0	0	0

Table 6.4: Household situations

In many cases, people are related to each other through their place of origin, i.e., the part of Fiji they originally come from. This is an important feature of both the *Girmit* and the *iTaukei* social systems. The principle of reciprocity rather than monetary reward is the basis of whether or not one is involved in work on the farms when it comes to members of the household or extended families. This is a strong determinant of relations between members of the households or extended community - that one day one would require the assistance of the other, therefore, payment for services does not take as high a position of importance as that of reciprocity.

The opinions of other communities remain a powerful sanction for culturally acceptable practices. There is still keen competition between groups that use the exchange system and the principle of reciprocity. This is what gives the sugarcane community their structural strength. People are seen to put in unlimited hours when a situation demands it. This was evident during weddings, religious gatherings and funerals among other events. Such contributions were influenced by a sense of obligation to other members of the community. People holding positions of responsibility in a household or in the community are respected and obeyed and have authority invested in them on the basis of their knowledge and the greater experience. It can be said, therefore, that the social standing and economic security of a family is fundamentally dependent on acts of social service.

6.3.6 *Other Sources of Livelihood and Income for Family Members*

Many of the cane farming families surveyed had family members living off the farm in urban areas. The lifestyle in the urban areas operates differently from that in the rural environment and paves the way for individualism. In the urban areas, cultural and societal values undergo substantial change. Table 6.5 provides information on alternative sources of employment for household members.

Region	No. of Households	No. of Males working Outside	No. of Females working Outside	Approximate Income from Alternative Sources of Employment (FJ$)		
Sigatoka-Nadi	6	5 from 6 household	1 from 6 household	Males	Minimum Maximum	5000 28,000
				Females	Minimum Maximum	12,000 12,000
Lautoka-Ba	11	2 from 11 household	4 from 11 household	Males	Minimum Maximum	8000 18,000
				Females	Minimum Maximum	4000 10,000
Tavua-Rakiraki	8	7 from 8 household	6 from 8 household	Males	Minimum Maximum	10,400 50,000
				Females	Minimum Maximum	3000 20,000
Labasa-Seaqaqa	4	1 from 4 household	3 from 4 household	Males	Minimum Maximum	100,000 100,000
				Females	Minimum Maximum	2080 15,000

Table 6.5: Approximate income from alternative sources

Those family members living away from their rural households have their own needs to look after, such as the costs of housing, education for their children, and luxury lifestyles - all of which affect how much time and money they have available to assist their families back on the farms. The growers did not consider these family members who are living outside the farming setting and earning money elsewhere as household members, although they may seek their assistance in times of hardships. Neither do they have any say in how these members of the family spend their income. Back on the farms, the migration of people to the urban centres and overseas is always talked about, and is seen as something which is happening with increased rapidity.

6.3.7 *Members Absent from Household*

The main reasons for members being absent from their rural household are marriage and study (refer Table 6.6). In the case of marriage, it is usually the daughters of the household who are found to be living away from the family with their in-laws. But both males and females were living outside for tertiary studies, usually in urban centres where the university campuses are located.

Cane Farm Region	Average Members Absent from household for more than 6 months		Reasons for absenteeism
	Males	Females	
Sigatoka-Nadi	0	0	Marriage and studies
Lautoka-Ba	0	0	
Tavua-Rakiraki	1	1	
Labasa-Seaqaqa	2	1	

Table 6.6: Household member absenteeism and reasons

6.3.8 *Household Possessions*

During the field work, it was noted that every household kept and utilised modern items in their houses which included modern domestic equipment such as tables, chairs, washing machines, refrigerators, sofas, laptops/computers (refer Table 6.7). Every household also owned at least one form of private transport or vehicle.

Average Assets per Household	Sigatoka-Nadi	Lautoka-Ba	Tavua-Rakiraki	Labasa-Seaqaqa	Total (Average)
Modern Chair	7	9	4	6	**7**
Table	4	2	2	2	**3**
Bed	6	4	4	4	**5**
Entertainment (TV, DVD, etc.)	2	1	1	1	**1**
Stereo/Radio	1	2	1	1	**1**
Washing machine	1	1	1	1	**1**
Cloth dryer	0	1	1	1	**1**
Generator	0	1	1	0	**1**
Refrigerator	1	1	2	1	**1**
Sofa set	2	2	1	1	**2**
Cell phone/Landline	3	4	3	2	**3**
Laptop/Computer	2	1	2	1	**2**
Sewing Machine	1	1	1	1	**1**
Vehicles (cars, vans, tractors, etc.)	2	2	2	1	**2**
Stove	1	2	2	1	**2**

Table 6.7: Household possessions

6.3.9 Hardships

6.3.9.1 Level of Indebtedness

While the standard of living for cane farming households have improved greatly since the indenture days, these improvements have been bought through the high levels of debt (refer Shephard: 1945; Fiji Sugar Inquiry: 1961, 1-2; Moynagh: 1981,

197; SCGF: 2009; 2011; 2015). For instance, a *Girmitiya* household in Lautoka provided me with a copy of their recent loan document in which it was stated that the cane farmer had borrowed an additional sum of FJ$3500 in 2016 for tractor repairs with a repayment period of 3 years at an interest rate of 6 percent per annum. Similarly, an *iTaukei* household from Rakiraki informed me that in 2017, they had borrowed FJ$700 from the SCGC on low interest rates to pay for their son's school fees. Another *iTaukei* participant also from Rakiraki informed me that her uncle has borrowed a sum of FJ$100,000 from Fiji Development Bank (FDB) for diversifying into dairy farming in addition to cultivating sugarcane.

In addition to increasing borrowings, the standard of living may also have been improved by remittances sent to farming households by family members living overseas, or members of the household working in the urban centres in Fiji, and as a result of incomes generated by other means described in this chapter.

Taking into consideration the total annual expenditure and total income from sugarcane farming, it is clear that most households are operating close to break-even point, or at a loss (refer Table 6.8).

Regions	**Sigatoka-Nadi**	**Lautoka-Ba**	**Tavua-Rakiraki**	**Labasa-Seaqaqa**	**Average**
Total Annual Expenditure (FJ$): Table 6.2 + Table 6.3	7556.76 + 5490 = **13046.76**	8457.60 + 8027 = **16484.6**	4854.84 + 11332 = **16186.84**	6489 + 6281 = **12770**	6840 + 7782.5 = **14622.05**
Average Harvest (tonnes)	133	175.45	149.25	175	164.425
2015 crushing payment rate (FJ$):	88.04	88.04	88.04	88.04	88.04
Total Income (FJ$): Average Harvest (X) 2015 crushing payment	**11,709.32**	**15,466.62**	**13,139.97**	**15,407**	**13,930.73**

Table 6.8: Socio-economic status of households

It is important to note, however, that the situation of one farmer household may differ greatly from that of another, due to the multi-factorial nature of the challenges they are faced with (refer Chapter Eight). The results in the table above may not therefore be generalizable to all the cane growers in Fiji.

6.3.9.2 Households Forced to Sell their Possession During Periods of Hardship

Cane growers in the Lautoka-Ba and the Tavua-Rakiraki regions indicated that they are at times forced to sell their possessions during hard times (refer Figure 6.4). Hard times included paying off debts and loans and meeting household needs. Items usually sold off included farming equipment and implements, cattle and poultry.

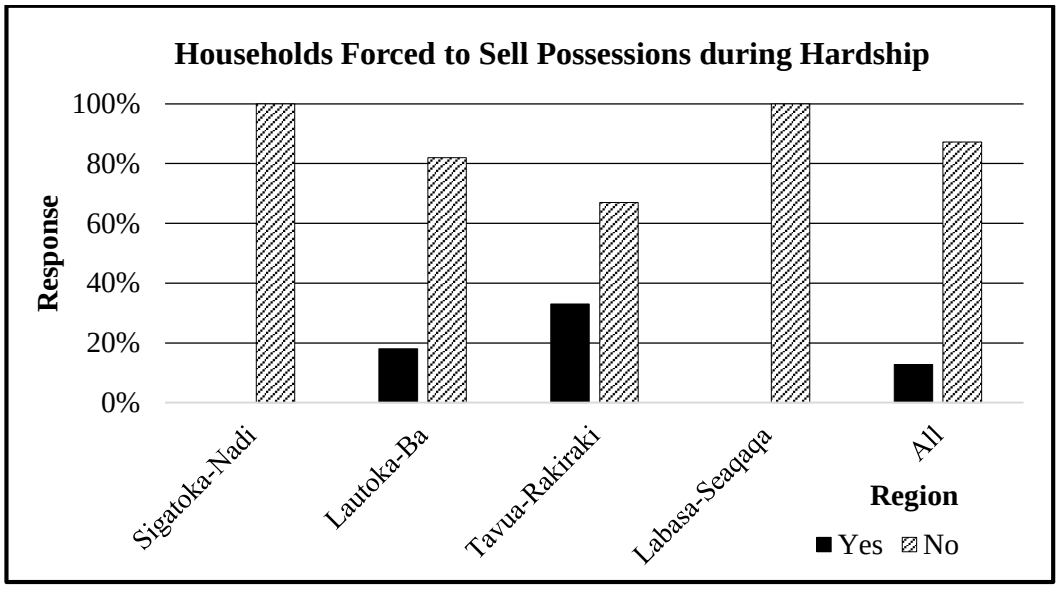

Figure 6.4: Selling of possessions by households during hardships

6.3.9.3 Selling off More Possessions than Usual and Changing Possession Status Over Time

Only households in the Lautoka-Ba region indicated that they have been selling off more possession than usual compared to previous years. Households in this region related the selling off of their possessions to the need to compensate for the increasing cost of living, and also their desire to venture into mechanized forms of farming. Figure 6.5 summarises the responses of the households in relation to selling off more possessions than usual.

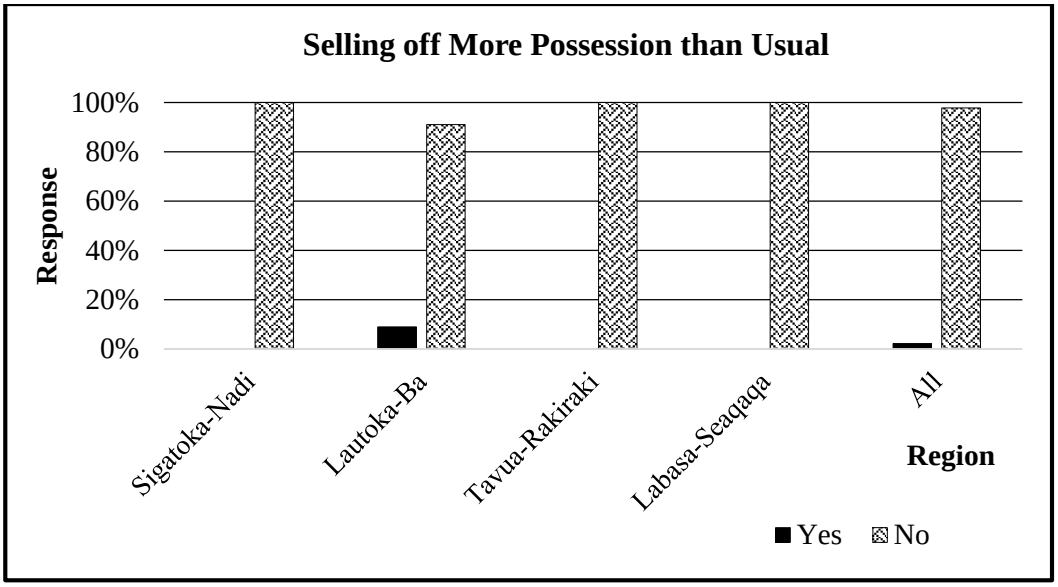

Figure 6.5: Selling off more possession than usual by households

Households from other regions have not as yet experienced having to sell more of their possessions than usual. They informed me that it is difficult to own assets and it takes them forever to accumulate them, therefore, they are usually hesitant to sell them.

Figure 6.6 summarises the responses of the households in relation to possession status over time. The majority of the households in all the regions stated that their total possession status has increased over time, except for the region of Labasa-Seaqaqa where increases balanced decreases.

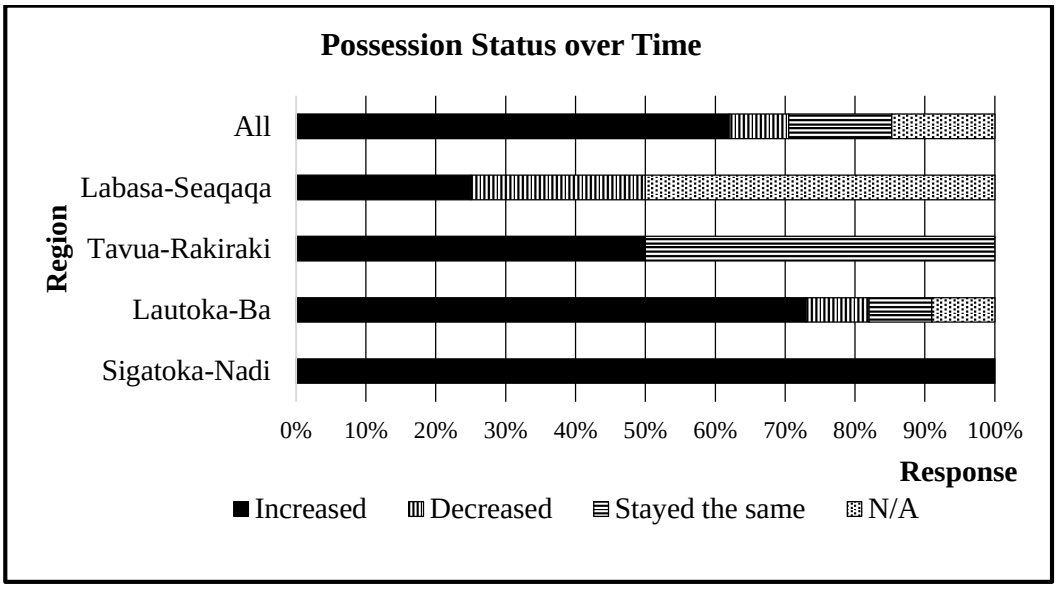

Figure 6.6: Possession status of households over time

When asked for the reasons behind the stagnant nature of their possession status, households in the Labasa-Seaqaqa region attributed it to the 'backward' nature of their community and their reliance on a simple way of life. It was quite evident that in this part of Fiji people continue to live a lifestyle devoid of modern excesses. I also noted that in this region that females take care of all household chores and males usually spent their time in the field working on the farms.

6.4 Residential and Housing Status

Carswell (2003; 2000) also noted that the households in Vanua Levu were deficient in basic amenities. At the time of her fieldwork, she observed that households lacked mainlined electricity and most families did not have electricity generators either. Therefore, access to electrical items such as refrigerators, microwaves, lamps, etc. would not have been available. She also noted that cooking was done on open fires and/or gas rings and spring water was pumped into nearly all the households for farm and domestic uses. Neither did any of her research households have any indoor plumbing, flush toilets or hot water (Carswell: 2003, 137). Most of the farms had rivers running through or adjacent to the farms. The current research, however, confirms that most of the households now have access to modern amenities.

6.4.1 Roofing Type

Out of the 29 households, 97 percent indicated that their house roofing was made of corrugated iron, and 3 percent indicated other forms of roofing materials, such as grasses and thick plastic (refer Figure 6.7). Even though most of the farmers had used corrugated iron roofing, the structures lacked proper engineering and cyclone proof fastening.

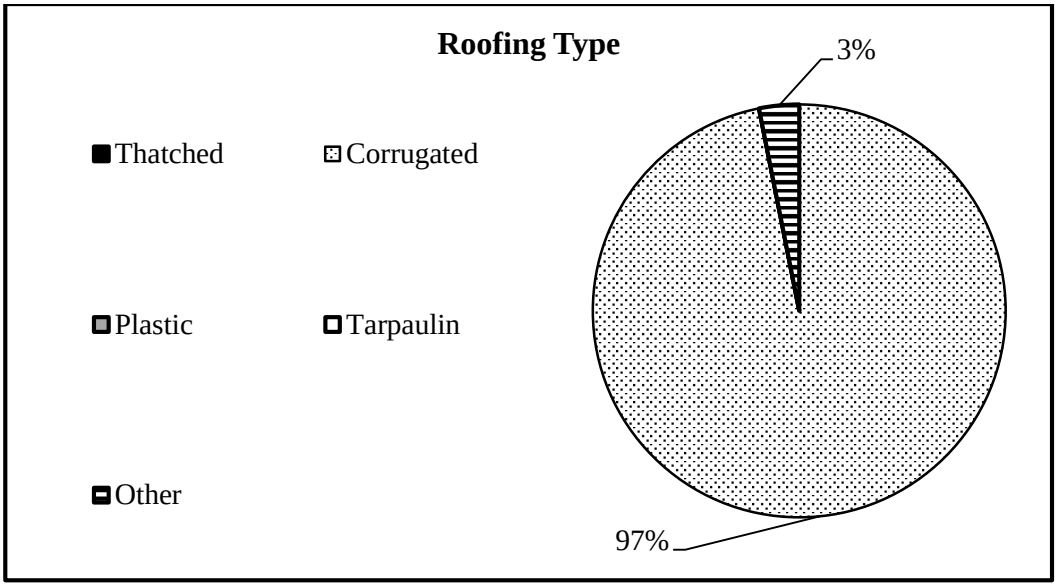

Figure 6.7: Household roofing types

6.4.2 Flooring Type

Out of the 29 households, 54 percent indicated that the flooring to their houses was made of concrete while 28 percent and 19 percent stated that it was made of mixed concrete/wood or wood respectively (refer Figure 6.8).

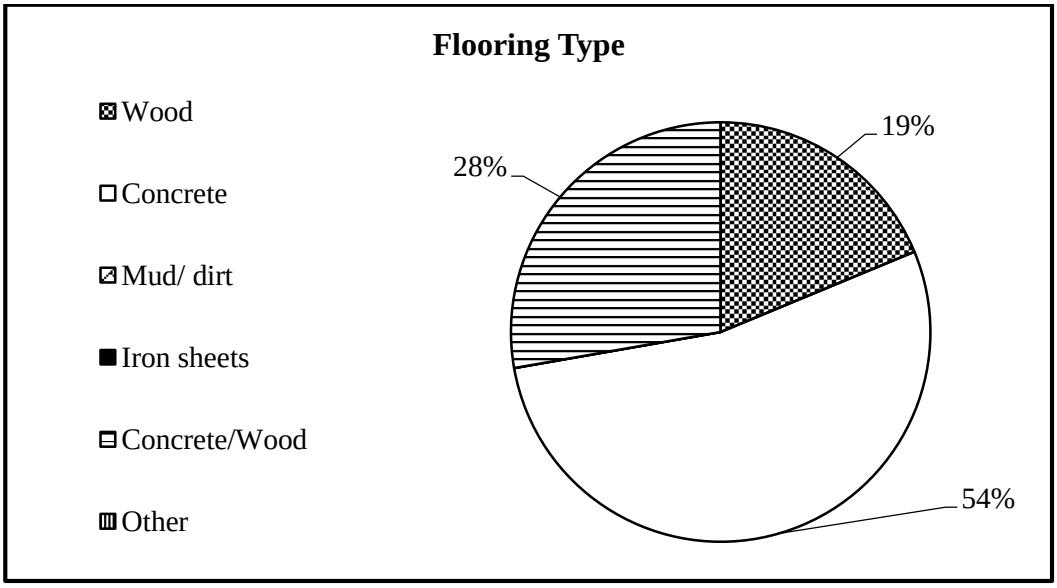

Figure 6.8: Household flooring type

6.4.3 House Wall Structures

Households have different forms of walls to their homes (refer Figure 6.9). It is common for the middle-class to poor members of Fijian society to use mixed forms of construction materials.

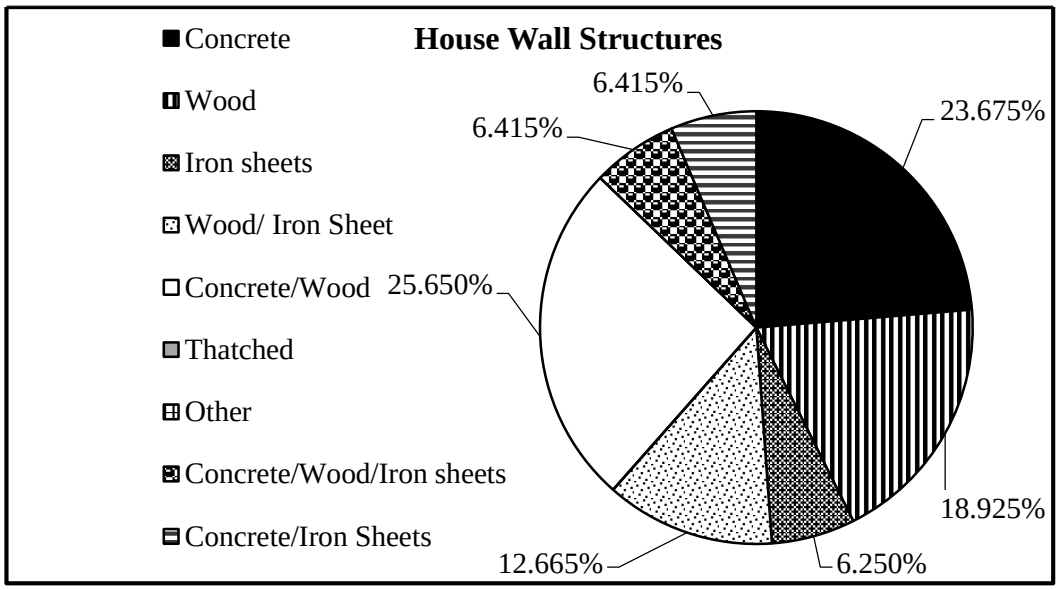

Figure 6.9: Household wall structure types

I noticed that walls were constructed of mixed materials and that the side walls had bigger windows. Upon enquiry, I was told that because the country is faced with cold and hot seasons annually, it was important that the houses be constructed of different forms of materials as this helps during the cold seasons, and bigger windows assists during the hotter seasons. During the cold seasons, people generally utilised rooms and places that were made of wood more often than those that were made of concrete and iron. In the hotter months, the large framed windows were wide open to allow for wind and breezes to cool the atmosphere inside the house.

6.4.4 Access to Water

The majority of the households had access to clean safe drinking water from a metered tap. However, some households also accessed and maintained other forms of water sources, such as springs, wells and boreholes (refer Figure 6.10). Families who retained others sources of water stated that such sources were useful in times of drought and when there were water cuts. The data presented in Figure 6.10 is not representative of those farmers who live in the more remote rural areas and in the highlands where access to proper water facilities remain a concern.

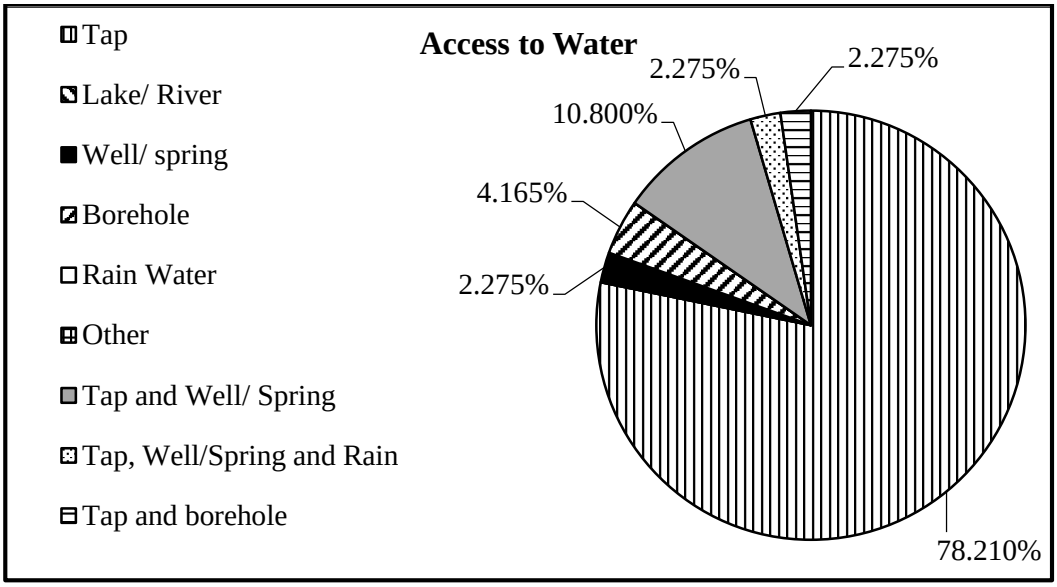

Figure 6.10: Household access to water

During the field visits, I noticed that almost every household had a tank through which the main water pipes ran before the water reached the actual homes. These tanks were used as a reserve to store water in the event of water cuts. Figure 6.11 below illustrates how the households in Lautoka keep a water tank for storing of water.

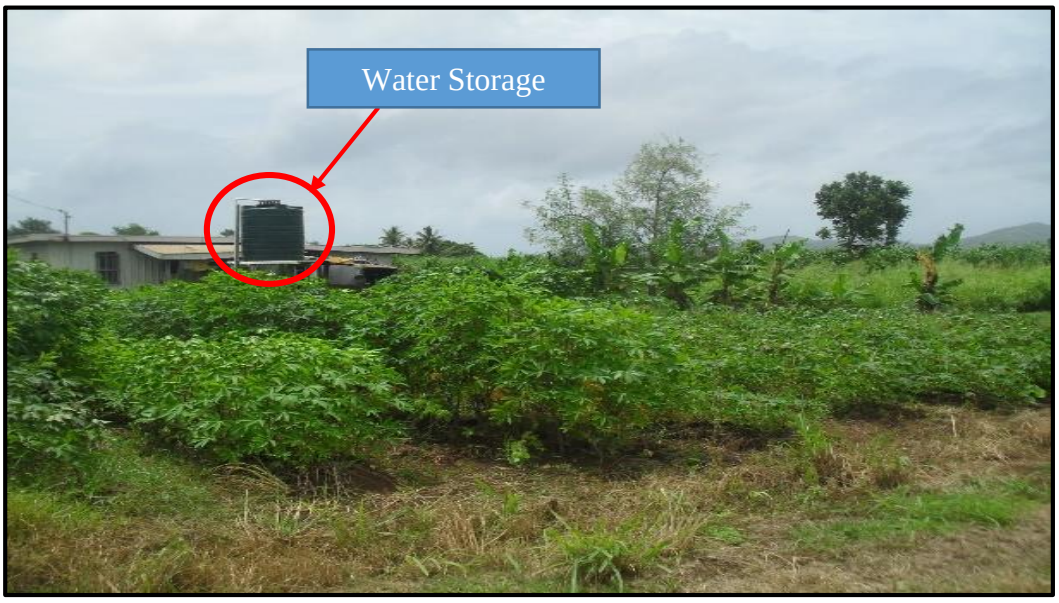

Figure 6.11: Water storage, Lautoka
Source: Author

The 2.28 percent of the households that relied solely on well/spring water informed me that they were ready to have proper water meters installed but were waiting for the Water Authority of Fiji (WAF) to initiate the process. Such process, however, usually takes weeks or months before meter installations are fully operational. I was

provided with letters written in 2014 by a *Sirdar* who was also once a councillor at the Lovu sector in Lautoka asking the WAF for installation of water as it was affecting the residents in the Buabua areas of Lautoka.

Figures 6.12 and 6.13 below shows an exposed well in the cane field in Sigatoka, and the use of bore holes in Lautoka respectively. Well/spring water serves purposes such as watering of cane fields and consumption by cattle as well.

Figure 6.12: Exposed traditional well
Source: Author

Figure 6.13: Borehole, Lautoka
Source: Author

6.4.5 Access to Toilet Facilities

A high percentage of the households have access to modern flush toilet facilities. A few, 3.18 percent, have water seal toilets while 4.18 percent kept flush and water seal both (refer Figure 6.14).

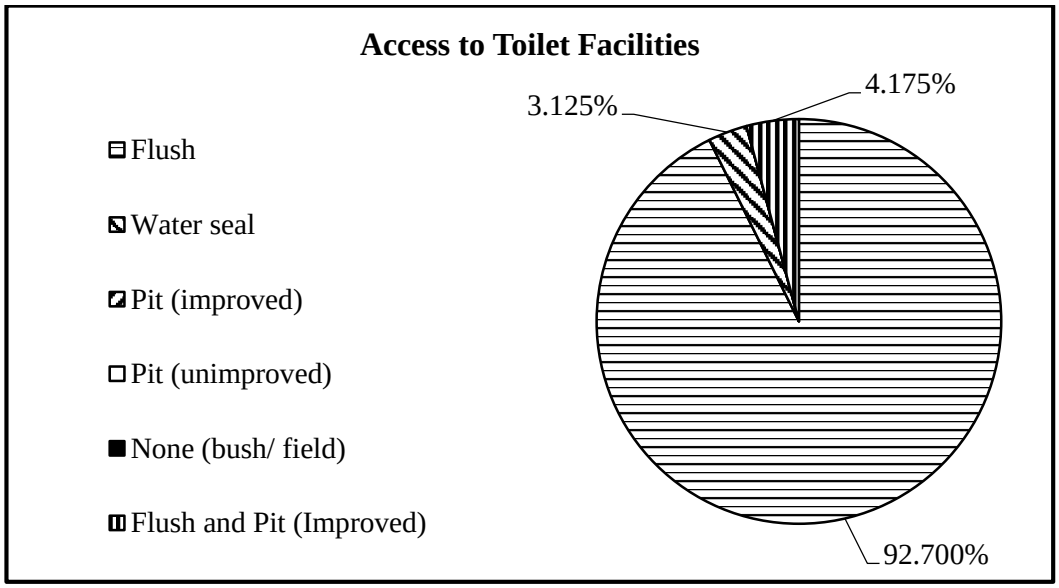

Figure 6.14: Household access to toilet facilities

Flush toilets formed part of the farmer's home structures while water seal toilets were separately constructed a meter or two away from the houses. The farmers relayed that flush toilet were considered cleaner and more hygienic than other forms of toilet facilities, but they had not forgotten the way they used to live previously during the *Girmit* days. They mentioned that the use of pit toilets, dug holes, and bushes were common during the older days of cane farming as affording modern facilities were then something they could only dream about.

6.4.6 Cooking Facilities

The households utilise a mixture of cooking fuels. There is heavy reliance on firewood and gas for normal day to day cooking, followed by kerosene stoves and electricity. There is moderate dependency on earth ovens (refer Figure 6.15). The use of electrical appliances such as ovens, microwaves, fry pans were often limited to weekends or specific cooking menus or when special food were cooked for visitors. The use of earth ovens was used for traditional food such as *lovo* and their use was common during special functions such as having guests from overseas or during festive seasons such as Easter and Christmas.

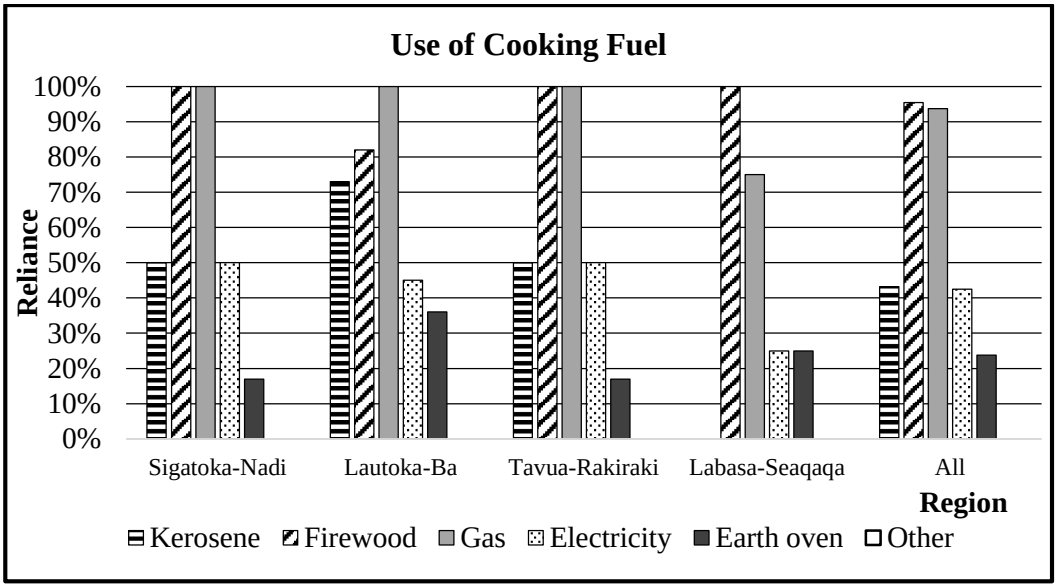

Figure 6.15: Household use of cooking facilities

It was noticed, especially in Labasa, Rakiraki, Tavua and Sigatoka, that in the afternoons after school, young children would go out into the forests and nearby fields with their mothers to collect fire wood for cooking purposes. Males of the households would also sometimes bring firewood home in the evening when they returned from the cane fields.

Many households kept a separate kitchen where they cook using firewood. Such kitchens are usually connected to the rear of the house. In Labasa, all cooking was done outside the main house with traditional stoves made of blocks or were traditionally hand crafted using soil (refer Figure 6.16).

Figure 6.16: Traditional cooking method, Labasa
Source: Author

It was also noted in Labasa that women make their own cooking oil from dried coconuts and the households rely mostly on rice from their own farms.

6.4.7 Lighting Types

Most households had access to electricity, and those that did not rely mainly on kerosene table lamps or candles, or were producing electricity from generators. It was noticed that a few the of households owned a separate generator for use when there were electricity cuts. Figure 6.17 indicates the level of reliance on different forms of lighting sources.

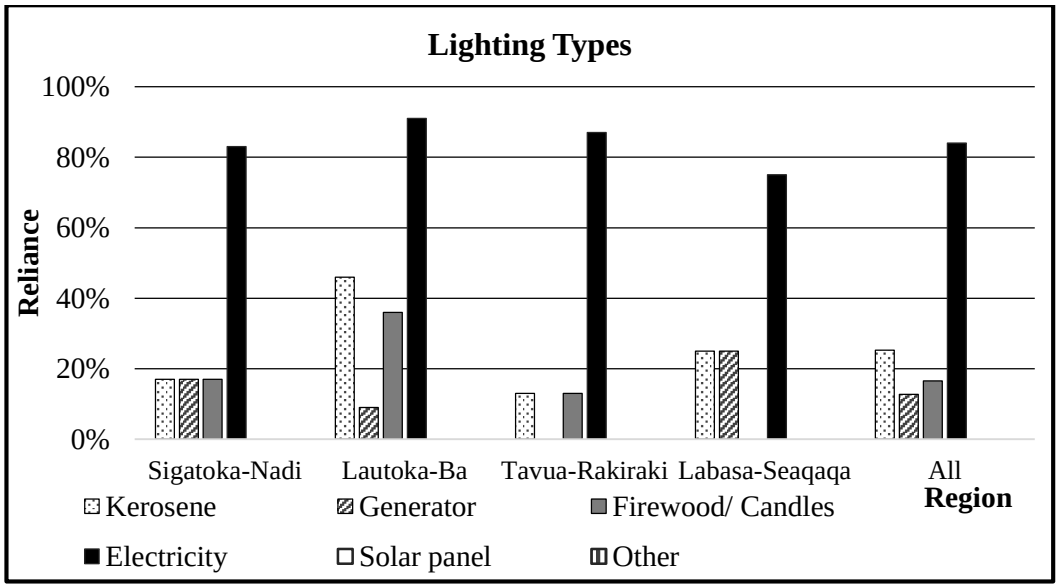

Figure 6.17: Household lighting types

6.5 The Agronomic Situation

The average size of farm that Carswell studied was 15 acres (Carswell: 2003, 136), and she found that the tonnage of cane produced varied between 30 and 300 tonnes, with majority of the households relying on between 100-200 tonnes as their main source of income in 1996.

6.5.1 Farm Characteristics and Land Tenure

In 2015, around 96 percent of the households contributing to the agroecosystem analysis were living and farming on leased lands. All households used the leased land for sugarcane farming purpose. Approximately 14 percent stated that they farmed on land to which they did not have entitlements under their own name (refer Table 6.9). This usually happens in cases where the households holding the lease are unwilling to farm their lands themselves, but wish to retain the land. They give the farm to close relatives or other members of the community who are willing to farm their land, and receive a share of the farm income in return. Sometimes they live on the land, or live elsewhere.

Usually, there exist informal agreements and arrangements as to the amount of land that is worked by a person other than the real owner. The same form of agreements and arrangements are made for the distribution of income arising from the sale of the harvested cane. The underlying factor in the determination of these informal arrangements is trust between the parties concerned. For example, the owner of a farm in the Tavua-Rakiraki region informed me that his cross-cousin worked the farm. The owner had migrated to Lautoka where he had been working as a driver for more than five years and owns a property and a passenger vehicle which he rents out to the public. The distribution of the proceeds from the farm was based on the 60:40 ratios. The owner received 40 percent of the total income while the cross-cousin took 60 percent. There were also informal arrangements made as to how they would share the bags of sugar received annually from the FSC[19].

[19] The FSC sells two bags of 50kg sugar annually to cane growers at a price lower than the normal supermarket price. The payments for the two bags of sugar is deducted from the cane payments arising from the grower's harvests.

I was informed that the cane varieties and the amounts of effort to be put into the farm is usually overseen by the farm owner in order to ensure that the person working the farm is able to produce an acceptable harvest each season. All of the equipment, farming implements, and animals such as bullocks are taken care of by the person who works the farm. The owner, although living in Lautoka, visited his farm in Tavua on a regular basis and had left his wife and his children there to ensure that there is always someone available to see that the cane fields were properly maintained.

Characteristics		**Sigatoka-Nadi**	**Lautoka-Ba**	**Tavua-Rakiraki**	**Labasa-Seaqaqa**	**Total**
Household owning land lease (%)	Yes	83	100	100	100	95.75
	No	17	0	0	0	4.25
Household Farming (%)	Yes	100	100	100	100	100
	No	0	0	0	0	0
Household farming land that they do not own (%)	Yes	0	18	37.5	0	13.9
	No	100	82	62.5	100	86.1
Household farming all the land they own (%)	Yes	83	36	50	0	42.25
	No	17	64	50	100	57.75
Purpose of possessing land and not farming on it		Lands which are devoid of cane plants are generally used for vegetable farming, and grazing and raising bullocks, goats and sheep. It is also used for residential purpose and some lands are leased out to other families that is an added source of incomes for the farmers. Many growers, for example in the Ba region are now utilising idle lands for dairy farming. In the Labasa-Seaqaqa region, these lands are utilised for rice and coconut farming.				

Table 6.9: Farm characteristics and land tenure

6.5.2 Agricultural Production and Practices

It is common that not all the available land is farmed for cane. The usual practice is for farmers to keep certain units of land for other purposes. For example, the portions of lands not in use for cultivation and production of sugarcane might be used for grazing cows or for diversification into vegetable and fruit production (refer Table 6.10).

Situations		Sigatoka-Nadi	Lautoka-Ba	Tavua-Rakiraki	Labasa-Seaqaqa
Total amount of land owned by the household (acres)	Minimum	3	8	8	12.35
	Maximum	20	20	30	158[20]
	Average	9.1	14	15	66.54
Total amount of land utilised during peak cane season (acres)	Minimum	2	1	5	7.54
	Maximum	19.5	9	10	7.54
	Average	6.75	7.5	7.14	20.14
Total amount of land utilised during off-peak cane season (acres)	Minimum	0	0	2	0
	Maximum	7	12	11	8
	Average	3	7	6.33	3.154
Total amount of land utilised for subsistence agriculture (acres)	Minimum	0	0.5	0.5	0.25
	Maximum	0.5	5	10	8
	Average	0.4	2.6	4.08	3
Situations on the amount of land used for agricultural purpose during the peak season in comparison to previous years (%)	Increased	0	50	32.5	0
	Decreased	17	25	0	25
	Remained the same	83	25	25	75
	Not relevant	0	0	32.5	0

Table 6.10: Agricultural production and practices.

6.6 Household Farming and Division of Labour in the Farms

Activities on the farms are primarily undertaken by male household members, followed by hired labourers (refer Figure 6.18). It was noted during the field visits that the farmer himself carried out most of the tasks and only needed the help of labourers during the cane harvesting period. Other household members are often

[20] The value in the Labasa-Seaqaqa region deviates from the actual norm when compared to the other three regions because one of the host participants is an 'outlier'- i.e., a non-smallholder sugarcane farmer.

seen working alongside the farmer in most parts of the cane belts (refer Figure 6.20).

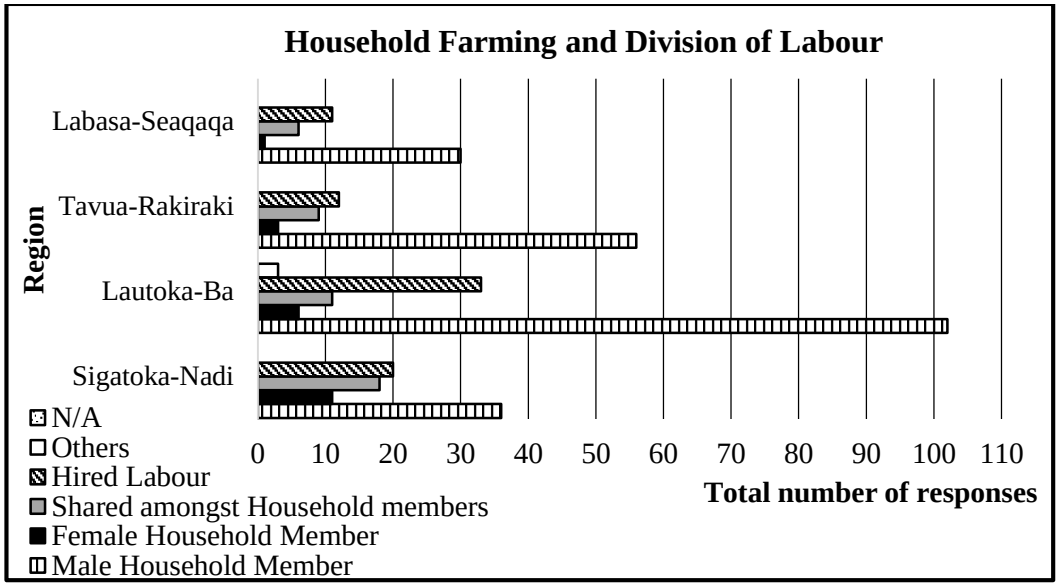

Figure 6.18: Household farming and division of labour

However, some farmers kept permanent labourers (refer Figure 6.19). One farmer in Nadi, for instance, informed me that, because they were constantly faced with labour shortages, they had resorted to the strategy of keeping permanent labourers. He had three permanent labourers working for him. In their agreements and arrangements, the owner of the farm had to house the whole family of the labourers and provide them with some simple monthly food requirements in addition to their wages. He did not reveal how much he spends per month on each labourer.

Figure 6.19: A permanent labour relaxing in one of the sugarcane farm owners home in Labasa
Source: Labasa Farmer

During my stay in Labasa in 2014, I came across one farmer where just him and his wife had harvested all the produce themselves and transported it to the Labasa Mill, because there were no other household members available, and also because they wanted to save money that would otherwise have been spent on the labourers wages and for maintaining them throughout the harvesting period (refer Carswell: 2000; Kumar: 2016; Sauvakacolo: 2016).

Figure 6.18, based on farm survey responses, indicates that women make only a minor contribution to farm work. However, during fieldwork, it was noted that women usually participate alongside men in cultivation and harvesting, weeding, hoeing, fertilizing, and grazing of cattle. In addition, they were also seen to be involved in selling other farm produce such as fruits and vegetables.

These fieldwork observations concur with the findings of Carswell (2003) in 1996-1997 that the unpaid work of women (and children) was integral to the production of cane, by contributing to the cane cultivation process and also by performing work that allowed other members of the household to participate in cane production. She noted that women (and children) were involved in subsistence agriculture, domestic work, animal husbandry, small good production for sale and exchange as well as production of cane. On this basis she argued that notions of 'family commitment' benefit the sugar industry.

But Carswell also found that women were noticeably absent from all the negotiations, debates and formalized structures of the sugar industry. For her then, "women and children were relegated to the world of family where they were simultaneously regarded as labour and as dependents" (p143), and that their unpaid family labour was seldom publicly acknowledged as important to the operation of smallholdings.

My own observations made during fieldwork concur with those of Carswell that the labour burden of the women exceeds that of men because of their higher proportion of unpaid responsibilities related to collecting fuel and water, preparing food, raising children, and having the overall responsibility of other household chores. Furthermore, with the increasing unavailability of male labour, the death of male household heads, and the movement of adult male children away from farming to

urban occupations, the trend is toward the increasing 'feminization of sugarcane agriculture' with women becoming the principal cultivators.

Women's involvement in decision-making in the sugarcane farms however remains poor, with women exhibiting low self-confidence, the majority of them lacking formal knowledge and having no access to farm information. The LCPA respondent in Labasa informed me during fieldwork that they have only had male farmers signing up for educational workshops and courses, and during farmer meetings, they have noted that male farmers are the only ones that attend. Women have, however, always been encouraged to attend and have shown good participation in recreational activities, community labour service, organic farming and poultry workshops organized by NGOs (LCPA: 2015, Semi-structured Interview). It would appear that prevailing gender role expectations might be a barrier to female farmer participation in formal decision-making and training opportunities, or that the structure of these opportunities is not amenable to female participation, as compared to opportunities offered by usually 'gender-aware' NGOs. Given the increasing feminization of the cane farming workforce, there is an urgent need for research into the barriers of female participation in formal training and decision-making opportunities.

Figure 6.20: Members of the same family (male and female) working together to fertilize the cane field in Labasa
Source: Author

6.7 Organization of the Cane Growers

Some 10 years ago, the sugar industry employed over 21,000 cane growers, but the numbers have gradually declined. The 2012 statistics on the registration of growers (refer Table 6.11) indicate that there were about 15,862 active growers running smallholder sugarcane farms in 2012. The majority of them are producing less than 200 tonnes of cane per year.

The vast majority of these growers have farm sizes of 4 hectares (10 acres); a legacy from the British colonial administration and the end of indentured labourer system in the 1920s when plots of 4 hectares of land were leased to individual growers. This area was considered to be sufficient to support a grower and his family.

Most growers plant and harvest manually, using hired labourers who work on a casual basis and are commonly known as 'sign man'[21]. Some farmers may also opt for contractors bonded by the Service Level Agreement (SLA)[22]. Every farmer is part of a gang of farmers (refer Table 6.11 and Figure 6:21). Different numbers of gangs collectively represent a 'sector' in each of the four milling areas.

6.7.1 Operational Structure of Fiji Sugar Industry

Milling Area	District	Number of Sector	Number of Gangs	Number of Growers
Lautoka Mill	Lautoka	5	216	2038
	Nadi	6	272	2065
	Sigatoka	3	106	1115
Rarawai Mill	Ba	7	340	3468
	Tavua	3	143	1579
Penang Mill	Rakiraki	3	182	1662
Labasa Mill	Labasa	7	418	3318
	Seaqaqa	3	168	617
	Total	**38**	**1845**	**15862**

Table 6.11: Structural division of the Fiji sugar industry
Source: SRIF and FSC

[21] A 'sign man' is usually a labourer sourced from outside the gang for harvesting of the cane for the farmer/gang after agreeing upon a contract. The farmer/gang at times have to pay an up-front sum/bond and/or meals/accommodation for binding with the 'sign man' months ahead before the actual harvesting begins.

[22] SLA: An agreement between the contractor and the farmer/gang with the conditions of cane harvesting.

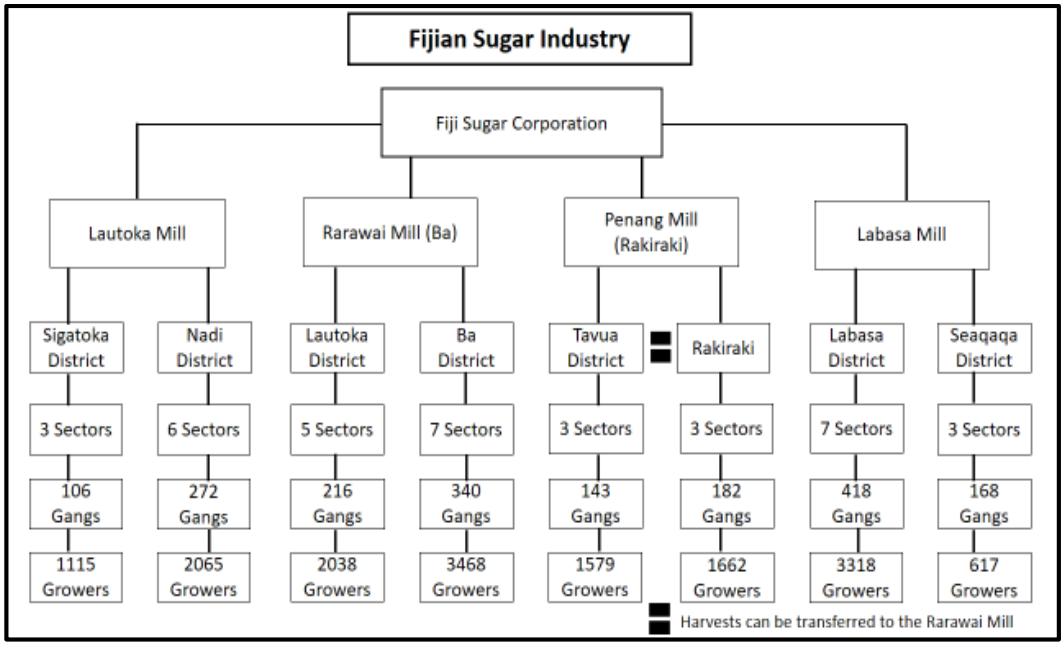

Figure 6.21: Operational structure of the Fijian sugar industry
Source: SRIF and FSC

6.7.2 Organization of the Gang

The gangs of farmers are bonded with the millers through a 'Memorandum of Gang Agreement' (MOGA). However, each gang has its own set of internal rules and regulations, based on the arrangements made between the gang of farmers and their *sirdars* – the individual cane growers who head the activities of their gang. Regulations may vary from one season to another. The *sirdar* holds a key position in the gang. He determines the work rhythm and also the ethics that prevails in the cane fields during sugarcane harvesting season. Decisions on harvesting, cane cutting, and payments to labourers during the harvesting seasons are all dependent on the conditions and the outcomes of a meeting held between the gang and their *sirdar*, usually during the non-harvesting season, or as soon as the harvesting season begins.

In addition to the *sirdar*, the harvesting group is made up of a *hukmaan*, a group of cane cutters, a *paniwala*, *pakki line* men, and 'sign man' (refer Figure 6.22). The *hukmaan* is responsible for overseeing of activities during harvesting period when the *sirdar* is absent from the field. The *paniwala* is responsible for providing refreshments to the labourers and cane cutters during harvesting whilst the *pakki line* men are responsible for maintaining the tramlines for loading the harvested cane crops onto the transportation vehicle.

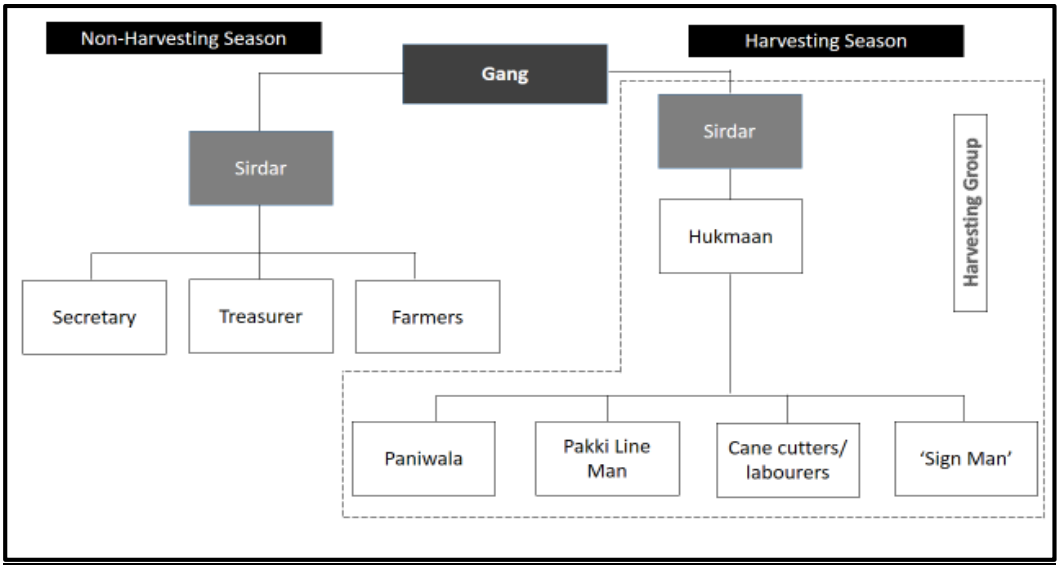

Figure 6.22: Organization of gangs

During the harvesting season, each farmer provides a cane cutter from his farm to the harvesting group. The cane cutter could be either himself or a 'substitute', usually a male member of his family or someone else. For example, during the field studies in Lautoka, once the FSC Field Officer had checked one of my farmer participant's cane field for cane maturation and had provided the gang *sirdar* with the green light to harvest the cane on the farmer's field, I noted that the farmer then provided a 'substitute cutter' to the harvesting group for harvesting his cane in addition to four hired 'sign man' who were hired by the gang, while he himself worked as the *pakki line* man.

The reasons for providing a 'substitute cutter' could be due to the lack of labour availability, or the grower is too old or sickly, or the grower is working elsewhere. Once the farmer's cane field was fully harvested, the harvesting group then moved to the farm of another farmer in the gang to harvest the cane there. The harvesting group then moved on to the farms of others in the gang to harvest the produce thereafter receiving confirmation from the FSC that the particular farmer's cane was ready for harvesting. At times, the harvesting group split in order to simultaneously harvest cane of different farmers in the gang at the same time (Field Notes: 2015).

The persons who had been nominated as the *sirdar* and the *hukmaan* maintained their position throughout the harvesting season, but people holding the roles of *pakki line* man, *paniwala* and cane cutters/labourers were rotated among the other

members of the harvesting group. The organization of the gangs is highly subject to variation. For instance, I was informed in Labasa that the harvesting groups assist the other nearby gangs in their own district or other districts as well due to lack of available labour. At times, females of the households also assisted in harvesting of the cane.

Generally throughout Fiji, there is a high dependency upon manual labour as mechanisation of cane farming is not well-developed in the cane belts, except for the large sugarcane holding farms. The advantage of mechanisation is dependent on the size of the cane plots. Diversification of agricultural produce other than cane is also not very well-developed, and the farmers grow other crops mainly for self-consumption. In some towns, such as Rakiraki, Labasa, and Seaqaqa, cane farming provides almost the only employment, without which there is almost no other source of livelihood.

6.7.3 Household Members as Participants in Other Farming Groups

Some members of the surveyed households were part of other farming groups, and worked for them in return for income and/or mutual benefits. This gave them access to other forms of goods and services, as described in Table 6.12 below. Some households supplement their farming income by foraging for food from other sources, and by hunting and gathering.

Regions		**Sigatoka-Nadi**	**Lautoka-Ba**	**Tavua-Rakiraki**	**Labasa-Seaqaqa**
Number of Households		6	11	8	4
Are there members of the household part of any other farming group or farm	Yes	0	4	0	1
	No	6	7	8	3
How many of them are working there		0	6	0	1
Number in paid labour		0	6	0	0
What is their total income per annum (FJ$)		0	7000	0	0
Did any member also work on other farms for exchange of food or services		1	1	0	0
What type of goods and services are received by the household for such an activity		Vegetables and fruits and farm services			
Does the household get any food out of hunting and gathering	Yes	2	3	2	1
	No	4	8	6	1

Table 6.12: Household members participating in other farming groups

Table 6.12 Continues

Places Gathered from:		Fishing and Gardening	Fishing and Gardening and crabs	Fish and Prawn from the rivers	Coconuts
Does the household get any food out of other activities	Yes	3	10	6	2
	No	3	1	2	2
Places		Fruit trees and gardening	Fruit trees and gardening/ banana and okra farming	Fish and Prawn from the rivers	Root crops and gardening
Did you receive any food aid in the past 12 months?	Yes	0	1	0	1
	No	5	10	8	3
	Did not answer	1	0	0	0
Has your non-farm income?	Increased	3	4	1	0
	Decreased	2	3	0	0
	Stayed the same	0	1	5	3
	N/A	1	3	2	1
Has the number of income sources for your household?	Increased	2	3	5	0
	Decreased	0	2	0	1
	Stayed the same	4	2	2	3
	Did not answer	0	4	1	0

6.8 Historical Memories and Contemporary Concerns

Living conditions under British and CSR rule were neither comfortable nor sanitary. Prasad (1974), for example, notes that the first batch of indentured labourers to arrive in Labasa on Vanua Levu in 1890 were allocated rooms that had wooden bunks fixed to the wall, a single blanket and a bed sheet for each labourer. Each room, measuring ten feet by seven feet, was occupied by three single male labourers, or if there were a married couple, a separate room was designated for their use.

The rooms were like barracks in long buildings with overhanging iron roofs on both sides to provide shelter, and wooden walls without windows. Rooms were separated by partitions that ended three quarters of the way to the ceiling with the gap filled by wire netting. The floor was of irregular surface to which the labourers had to apply cow dung and clay to level them. Toilets were some distance away from the lines with a partition separating those for males and females. These conditions were

better, however, than those they were used to in India, and they were improved after 1908.

Bitter sentiments remain, however, about the way the growers were treated during the Indenture period. As one of my master farmers (79 years) stated:

> My parents suffered a lot in the hands of these so called 'sahebs' (a white sir/master) or the 'memsaheb' (wife of the white sir/master). They considered themselves superior over the others. My parents were not allowed to talk back to them. They had to wake up as early as 3am to start work for the day……if they did not wake up……they would whip them using a 'chabuk'. For them our women were sexual pleasures. They would look for opportunities to rape them. They had no value for mothers, wife, and daughters……not even the elderly. They thought that my parents were brought to follow their orders (with tears in his eyes). They considered the labourers as outcastes……they are 'firangi' to any other race in this world……they themselves have taken up other parts of the world……I don't know why they would do such things to our parents (with head facing the floor).

The farmer research participants still harbour sorrowful memories and fear of the *Girmit* days, even though the indenture system ended in 1920 (Sandhu: 1965). Growers' perceptions are that there has been a lack of development of the social and cultural aspects of farming. In the Tavua-Rakiraki and northern parts of Fiji, cane farmers hold hostile memories of the conditions under which their ancestors had worked.

Almost all farmer participants were able to recall the harsh conditions under which their ancestors worked during the CSR and British rule. They feel the only thing that has changed since the days of CSR is that the European colonists had left Fiji; the way the sugar industry operates has not changed since its inception.

> *"Gorwan Chal dain, chabuk chor gain"* [the whites have gone, but left their whips behind] (Sigatoka Farmer: 2015).

> "Humme to lage hai ke homlogon to abhi bhi girmit wala system pe hai……ganne kamao……kato……paisa jab mili to mili……abhi market

> mei kuch tarkari becho daam humme pata rahi par ganna ke daam……nahi pata bhaiya……nahi……" [I feel like we are still in the *Girmit* days and systems……toil cane……harvest……when we receive the payments we will……if we sell some other produce in the market we know the price we will receive, but with cane we know nothing……we know nothing……nothing……] (Labasa Farmer: 2015).

Given the downturn in the industry, and the knowledge that their farms were incurring losses, it was also important to analyse the factors that kept the farmers committed to the sugar industry. From the analysis, it is not only about the returns from their produce, but rather the social, emotional, and sentimental values attached to farming.

> Hum logon to yahi mei pal ke bara bhaya hai……yehi hum logon ke roti raha aur hum logon iske kaise sakta chore……larkawan ke yehi se barha kara, yehi se parhaya……tum batao bhaiya… [we have been brought up in the sugarcane farms……the farm has been our bread and butter and our only source of livelihood……it is only through the cane farming that we have managed to look after our children, educate them……] (Nadi Farmer: 2015).

The issue of the downturn in the industry, while discussed superficially by growers in other regions, took a different turn in the northern region. The farmers there stated that more than a century has passed since the first planting of sugarcane as a commercial product, and since then the country has moved on. However, for a majority of the participants, specifically in the northern part of Fiji, they felt that they were still living in the age of *Girmitiya*.

In the north, although lower prices of sugar were of great concern, there were other major issues that remained unsolved.

> *Fiji ke jon ganna ke kisaan logon hai, elogon ke liye koi support nai hai aur hum logon ke problem sune wala koi nahi hai…* [There is no one to support the farmers, there is no one to listen to us] …there is no representative, no farmers' union either. If we calculate profit and loss, then 75 percent of the total earnings are costs and 25 percent profit. The 25 percent profit if we calculate, it takes 5 months to receive the revenue

> from FSC. So how do you think farmers will be able to pay for the labours in their farms for this five months, where would we buy our pesticides and weedicides from, and more importantly how are we going to manage our household expenditure? This ultimately leads to farmers seeking loans from elsewhere. With loan comes interest *aur e rakam se kisaan dabeke daba rahe jawe* [there is no potential for growth for the farmers]. If we compare ourselves to the civil servants of the country, they receive their salary every two weeks, however, poor farmers like ourselves receive money on 3 months, 5-month time period. As illiterate farmers, we do not know where decisions are made, approvals and disapprovals take place when our cane payments will come in - leaving us in dark. Let alone we are not able to read the balance sheet [the balance sheet is actually the annual financial statement provided to the grower by FSC which is reflective of debits and credits of two harvesting seasons; payment from previous year's harvest which comes in after January 1st in the current season plus payments from harvest taking place in the current year till December, 31st] ……we hear and have learned these terms, but we do not know what they are and what it means (Focus Group Discussion: 2015, Labasa-Seaqaqa Region).

For the respondent from the LCPA, successive Governments, before the current one, had failed to recognise real time issues farmers were faced with and provide them with the support they needed, especially when the land leases started to expire under the ALTA (1976). In Chapter Five I have used the term 'leaseophobia' to describe the deep concern of farmers over this issue (refer Section 5.5.1).

6.9 Reflections

The life of the smallholder cane farming household in Fiji is as a member of a community that is a product of an industrial agricultural system, but at the same time, one that has harnessed other opportunities that the agrosystem has made available to them. Their livelihood is based mainly on the sale of the commodity they produce for the sugar industry, but is supplemented by crops that they sow independently on their farms and the cattle and poultry they raise.

Clearly, the current socio-economic situation of the cane farmers has improved greatly since the colonial days, and when the Fiji Government first took over from the CSR, but they are still faced with serious sets of problems. The main problems facing cane farming communities today derive from shortcomings of policy, limited availability of finances, lack of security of land tenure, lack of accessibility to suitable services and infrastructure. Solution to these problems will require the integration of resources of various stakeholders from both the Government and the private sectors, and the efforts of various academic disciplines working together with the cane growers. Central to these solutions will be the contribution of the sugarcane growers themselves, the group that has contributed most to the development of the cane fields in Fiji by providing their energy, skills and knowledge, but whose voice within the industry has historically been marginalized.

6.10 Chapter Summary

This chapter has provided a brief ethnographic portrait of the *Girmitiya* sugarcane farming community, followed by a profile of their socio-economic situation, residential and housing status, agronomic situations, household division of labour, organization of sugarcane growing, historical memories and contemporary concerns. It provides a window onto their everyday situation and struggle for survival in the cane fields of a modern developing Fiji. The next chapter documents the ITK of the sugarcane farmers, which it is suggested may be the largest untapped source of solutions for the sugar industry's current problems.

Chapter 7 Indigenous Technical Knowledge

7.1 Introduction

Over the last 30 years, there has developed two approaches to indigenous knowledge research, each proceeding from different research processes and intellectual traditions. The first, rooted in the natural sciences, emphasised indigenous *technical* knowledge. Here, soil scientists, agronomists and agro-foresters utilized local indigenous knowledge to overcome problems of rural development, natural resource management and agricultural productivity. The second approach, rooted in the social sciences, emphasised local indigenous knowledge and a basis for rethinking the whole nature of the development task focusing on how development projects and programs were conceived and executed. The former approach tended to be particularistic and instrumental. The later more holistic and interpretive (Flavier et al 1995: 500; Biggs: 2005, 101). These approaches are not incompatible, and can be combined in cross-disciplinary research to provide a more holistic analysis. In this chapter, the focus is on 'Indigenous Technical Knowledge' (ITK).

ITK is only recently coming to be recognised for its potential for solving challenges pertaining to economic development and agro-environmental management, and in this chapter I present some of the knowledge, experiences and wisdom that the *Girmitiya*s and their descendants have acquired since the indenture period, and which they continue to utilise in their lives today, from the preparation of lands for planting of sugarcane to the harvesting and transporting of their produce to the mills for further processing into sugar and other value-added products.

In Fiji, the lack of research on the importance of ITK for food and income security of rural smallholder agriculture and the sustainability and conservation of agrobiodiversity is significant. In order to address this gap, this research seeks to investigate the role of ITK in the sustainability of smallholder cane farming in Fiji.

Brooke (1993) affirms that it may not be possible, or even advisable, for one definition of ITK to be adopted universally. The underlying concept of ITK is that it is an integral component of the culture and history of a local community, and has evolved through years of regular experimentation in their day-to-day life with the

available resources of their surrounding environment. In the case of the *Girmitiya* community and their descendants in Fiji, they have accumulated a vast repository of ITK in the sugar industry for over more than a century, since the beginning of indenture system in 1879. Although the *Girmitiya* community is not indigenous to Fiji, they are indigenous to the sugar industry in that country, and in that sense, their traditional farming knowledge can be described as ITK of the sugar industry.

The following sections document the ITK of the *Girmitiya* and their descendants. The information furnished in this chapter originates from interviews and informal discussions with master sugarcane farmers and their descendants, mostly the male respondents who are currently involved in sugarcane farming, and from observations made during the fieldwork phase of this study.

7.2 Traditional Methods of Land Preparation and Cane Planting

7.2.1 Land Preparation

In the early stages of farm development, the farmer will traditionally need to *parthi* (fallow) his soil. He does this to increase the strength of the soil by leaving the piece of land idle for a year or so. He can also bring in Mill mud (remains of processed canes from the mills) (refer Figure 7.2) to apply to the land during the *parthi* period. Additionally, the *parthi* field can be used for cattle grazing.

Once the *parthi* period is over, the farmer needs to turn the soil. This is done by firstly clearing the field of the bushes and grasses that have grown during the *parthi* period. The cleared vegetation is collected for cattle fodder. The farmers will then collect all the stones from the field and pile them into chains at the boundaries of their farms. Finally, once the land has been thoroughly cleared, the farmer ploughs the land. In the past, ploughing was done using a *fulawa* (hand ard) and a pair of bullock. This is still common in parts of Sigatoka, Rakiraki, Tavua, Labasa, and Seaqaqa, but elsewhere, mechanical equipment is used. Ploughing is carried out twice. During the first ploughing, the farmer has to ensure that he only ploughs 3 to 4 inches into the soil. The second ploughing is to the depth 5 to 7 inches. Ploughing twice allows for materials such as dead roots and other debris to be pulled out and churned into the soil. The process also results in big chunks of soil known as *dhela* that are important later for making up the top soil.

The large blocks of *dhela* are left in the open to be dried by the sun until they start to show signs of cracking. The farmer will then wait for the rain. When it rains, these *dhelas* will dissolve in the downpour to becoming sandy. The field is then ploughed again. If there are still some chunks that have not dissolved into dust, they are 'hangered'. Hangering is a process of using a 'scuffler' (a form of harrow) to break up the soil. Hangering is repeated three or four times before the land is prepared for planting of 'seed cane'[23].

Once all the soil has turned sandy, the farmer needs to *hangaow* (a process similar to that of hangering, but this time it involves vigorous turning and mixing of soft sandy soil) his farm using a 'hanger'. After this, the farmer uses an *arakasi* (a single bladed Lesters cultivator) to create the *pahis* (rows) for planting the new 'seed cane' (cane shoots from which new canes will grow). One end of the seed (a short length of cane) is used to carve a shallow furrow in the *pahi* into which the seed is laid horizontally so that roots can germinate from its sides.

7.2.2 Planting

Single row planting is the traditional method of planting canes. One has to leave 1.37 meters between the parallel rows. Usually there are three people involved in the seed planting process. Traditionally, farmers would plant *peelaat ganna* (seed cane from first ratoon[24]). If one is not able to get *peelaat ganna*, then the farmer has to look for *kuthi ganna* (second ratoon cane crop) from elsewhere which is transported for planting using a *ghaseeta* (a form of sled) (refer Figure 7.12). The seedlings are carefully chosen for good quality, and *hevd* (distributed) amongst the labourers for planting. Those found to be not of good quality and to look unhealthy are put aside. To differentiate a good cane seedling from a bad one, one looks for defects (such as membrane ruptures), or those that do not look fresh, as these will not grow, or if they do grow, will not be productive plants.

The seedlings are placed in the *pahi* by one person in an orderly manner and the second person is assigned to cut the seedlings to certain sizes. The third person is

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[23] 'Seed cane' here refer to smaller cuttings of sugarcane stalks with eye bud of the cane stalk still intact. The cane seedlings are carefully selected by the growers for cultivating into new sugarcane crops.

[24] New shoots springing from sugarcane root after cropping.

tasked with planting the seedling. The seedling is placed in such a way that the eye budding portions is facing side-ways and all the leaves attached to the seeds must be removed. The presence of leaves on a seedling slows the process of germination. The person portioning the seedlings with a knife must ensure that they do not damage the eye buds from where new plants will germinate. One needs to push the seedling slightly into the soil and place it in such a way that the eye buds from both sides of the seedlings are exposed. This ensures that all eye buds will grow at once, giving a higher chance of all the shoots germinating. Each seedling has to be placed 1 inch away from the other, and each of the seedling is chopped at the *nas* (vascular bundle). Once everyone has completed their individual tasks, all three workers will work together as a team to cover the seedlings with soil.

Traditionally, covering the seedling with soil is done using one's feet forming mounds over the planted sugarcane seedling. This is to ensure that seeds are not too heavily covered by the soil nor too lightly covered. Heavy covering will result in either slow germination or no germination at all, while a too light a covering of soil would result in the seedlings being exposed to the sun if the soil cover is blown or washed away by the wind or rain.

7.2.3 Cultivation

In 3 to 4-weeks' time, the seedling will start germinating and the new shoots will push themselves out of the soil. These small shoots are known as *tilla* in the Sigatoka-Nadi region, *choki* in the Tavua-Rakiraki region, or *pulai* in the Labasa-Seaqaqa region. Weeds growing alongside the germinating seeds are removed using a *kudari* (hoe). Once the weeds have been removed, fertiliser is immediately applied to stimulate faster growth. The farmers hoe their farms not only to remove weeds, but also to allow more shoots to germinate from the breakage of *naya kallas* (first new shoots) through the hoeing process. The farmers keep a small control field whereby they can check on the effects of hoeing his production field. The level of cane growth in the hoed fields compared to that in the non-hoed field informs him about the health of his new germination.

The process of breaking the new shoots results in four to six more shoots growing from one shoot, a method of increasing production. Further to this, the farmer needs to carry out *harai pura bera*, meaning, if the rows of newly germinated cane plants

are running from north to south, then the farmer needs to hanger the farm from east to west, or west to east, and similarly, if the newly germinated plants are planted east to west then *harai pura bera* needs to be carried out from north to south or south to north.

Whilst the new cane seedlings are germinating, the farmer usually plants beans and other leguminous plants together with the new canes, as they use less water and are generally short-lived. As soon as this leguminous plants start to bud, they are pulled and churned into the fields using the *fulawa* (plough) usually pulled by bullocks. Some farmers may carry out the planting of leguminous plants during the *parthi* period as well.

This intercropping during the primary growth phase of the new seedlings is believed to give the soil more strength and increase fertility. Some farmers also plant *arhar* (pigeon plants) at the boundary of their farms (refer Figure 9.16). The planting of *arhar* serves many purposes; it acts as a windbreak for the newly germinating cane seedlings; it has good height which acts as a shield by providing shade for the germinating seeds; and it helps in retaining moisture to some degree, and providing cover from heavy downpour and erosion. More importantly, the seeds of the *arhar* can be dried and kept for long periods as an additional source of food for the households.

The Acting Permanent Secretary of the MoA stated that the practice of intercropping and diversification used to be carried out in the olden days.

> "Intercropping for them meant use of many species in given area and realising its maximum potential. Re-diversification - these are traditional knowledge already. Our ancestors used to integrate and intercrop. Now we have moved into mono-cropping or single, and we are realizing the problems with this practice" (MoA: 2015, Semi-structured Interview).

The cane farmers in Fiji also practice multi-cropping. Multi-cropping in the cane fields ensures continuous availability of food, and forms an adaptive farming measure that allows access to a variety of food sources from the same field or other gardens at all times. Even on the *parthi* (fallow cane fields), fruits such as breadfruit, jack fruit, mangoes, coconuts, oranges, and root crops such as taro, yam and cassava are found growing, and this regeneration can be encouraged through irrigation, terracing and swamp draining systems as in the case of the taro leaves that requires the supply of continuous moisture for growth.

As Altieri (1987) explains, citing case examples from Africa and other places, multi-cropping systems remains a farming norm and land use practice in many parts of the world. The author describes it as a traditional strategy for the promotion of diet diversity, generation of income, maintaining stability in production, minimization of risks, reducing insect and disease incidence, promotion of efficient use of labour and intensifying production with limited resources, which in-turn maximises the returns under low levels of technology.

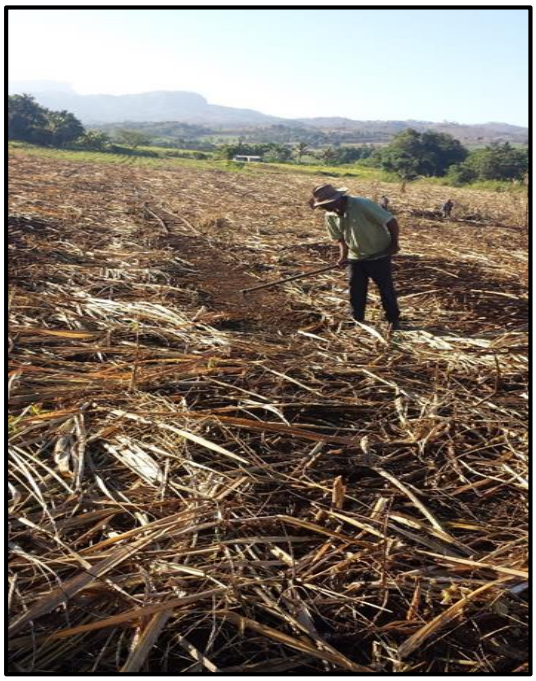

Figure 7.1: Farmer working on slanting terrain
Source: Author

In Fiji, however, farmers have to be careful as to what plants they intercrop with the canes. For instance, I was told that planting of corn in the cane fields make the soil weaker and that is the reason why the majority of them do not plant corn in

their cane fields. An article, "Malnutrition in the well-off farmer" in the *World Development Forum* (no longer in print but captured by a Canadian Aid Agency in their magazine International Development Research Centre (IDRC) featuring the work of Dr. Govinden), Govinden states that maize, when intercropped with sugarcane plants often "reduces the cane yield due primarily to competition for light by the tall growth of the maize plants. The extent of reduction depends on the height, time to maturity, and leafiness of the maize plants. There are no evidence of any effects of intercropping on insect or disease damage, either positive or negative" (Govinden: 1989).

In another study, Zarekar et al (2018, 139) found that sugarcane intercropped with green gram and groundnut were able to increase yield in paired row planted sugarcane. The investigation also found that sweet corn was suitable for intercropping with paired row planted sugarcane, and that fertilizer uptake efficiency was marginally higher when sugarcane was intercropped with green gram and groundnut. In Mauritius, where there are two cane-planting seasons, in the first season, maize is harvested before, and in the second season, after the cane. The peak labour demands therefore do not overlap. Similarly, ratoon crops grow more quickly than newly planted cane and hence are more competitive with maize. Therefore, maize has less adverse effects on the cane when it is a ratoon cane crop.

While intercropping of maize may have some advantages, in Fiji both mechanical and manual harvesting would be a problem, as sugarcane can be and often is grown on lands too steep for mechanical harvesting (refer Figure 7.1). The benefits of intercropping of sugarcane on such lands, however, is that maize confers additional protection to the soil from the erosive action of rain during the establishment period of the cane.

7.3 Traditional Methods for Yield Management

7.3.1 Growth Management

In the cane fields, it is important to ensure that the roots of the cane do not reach out to each other from one row to the other. This requires consistent overseeing of the fields to avoid the roots entangling while the shoots are growing. Entangling of the root system will increase competition and weaken the root system. Therefore,

once the shoots have reached the height of one foot, the farmer needs to prune the cane plant roots from both sides of the furrow. This involves pushing the soil from both sides of the plant along the furrow ridge to expose and cut off the roots.

This technique is possible only for areas where a *fulawa,* usually operated by bullocks or horses, can be used. Otherwise, the farmer needs to use the *kudari* (hoe). If this is also not possible then farmers have to carry out the process manually using their hands. The side dressing of the plant roots is believed to make the root system stronger. It will also strengthen the new shoots.

Many farmers, soon after the above activity, start hangering of the field - a widely used practice that allows for extra shoot germination. However, with this approach, only the main shoot will remain strong compared to the rest of the shoots. The growers described this as a trial and error method used for increasing the number of cane stalk outputs.

Another reason for doing this is to open the soil *(matti kholo)* for the application of fertiliser. Soon after the roots have been dressed off using the *fulawa,* fertilisers are applied.

7.3.2 Fertilizer Application

After the process of *matti kholo,* the farmer needs to carry out the same process of hangering from the opposite direction of the row beds to ensure that the fertiliser and the sand has been well mixed into the soil and that the roots that were pruned off have been covered again. There are various reasons for this. Firstly, it helps limit the massive growth of root. Secondly, it ensures that the plant uptakes the fertiliser that has been applied to the soil, and finally it allows for confirmation that the root system of the plant remains covered with soil that may have been washed or blown away after the seedling was initially placed. The plant is then left to grow for some time while the field is continuously being cleared of incoming weeds and herbs.

During the late 1800s and early to mid-1900s, there used to be only one form of fertiliser recommended by the CSR, and that was called *ujjar masala*, also commonly known as Urea. The farmers had to prepare this fertiliser themselves. They would combine the *nimak* (urea), *rakhi* (mill mud/ash) and *potus* (potash), mixing them together on a tarpaulin or in a sack. Many farmers would also add sand

to the mixture. It is believed that fertiliser is a hot substance, and the sand helped to cool the fertiliser and the soil during the seeds germination period. Currently, the South Pacific Fertilisers Limited (SPFL) recommends that a fertiliser named Blend A be applied to the newly germinating cane.

Even so, natural fertilization of soil is preferred by the farmers and is regarded more highly than chemical fertilizers, although many farmers have become reliant on fertilizers supplied by the FSC, or bought from the SPFL. Some farmers disregarded the fertilizers supplied by the SPFL stating that the company had brainwashed them into buying this fertilizer.

> "Why do we have to buy from only one source……they have brainwashed the farmers that their fertilizer is the best……the fertilizer is hopeless, they are still researching on the type of fertilizer that can prove worth to different varieties……they have been doing this for many years now" (Focus Group Discussion: 2015, Sigatoka-Nadi Region).

To improve soil fertility, many farmers used organic matter such as the mill mud[25] (refer Figure 7.2) and animal manure (refer Figure 7.3). Silici (2014) argues that the efficient use of 'soft' inputs (such as knowledge and skills) and other resources such as labour, along with diverse agricultural 'by-products' (such as animal manure and crop residues) should in principle guarantee the financial viability of such agroecological practices. However, there remains little research data on how the sugarcane farmers integrate these resources ('soft' inputs, labour, and agricultural 'by-products) into their farming in Fiji.

[25] Mill mud is a by-product of sugarcane milling and is also widely known as filter cake, press mud, and cachaza. It consists primarily of ground sugarcane leaf and stalk material, soil, and lime added in the clarification process. It contains high concentrations of Nitrogen, Phosphorous and Calcium. However, the exact nutrient concentration of mill mud varies due to differences in sugarcane variety, soil type, and mill performance (Gilbert, R., Morris, D., Rainbolt, C., McCray, J., Perdomo, R., Eiland, B., Powell, G. and Montes, G. 2008. Sugarcane Response to Mill Mud, Fertilizer, and Soybean Nutrient Sources on a Sandy Soil. *Agronomy Journal,* 100**,** 845-854.).

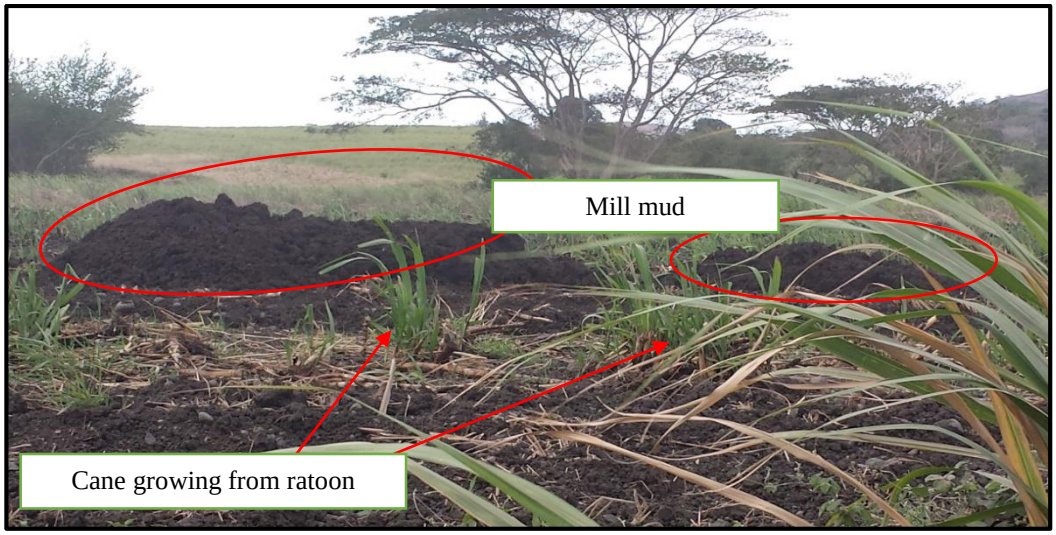

Figure 7.2: Farm soil is mulched with mill mud to improve soil fertility
Source: Author

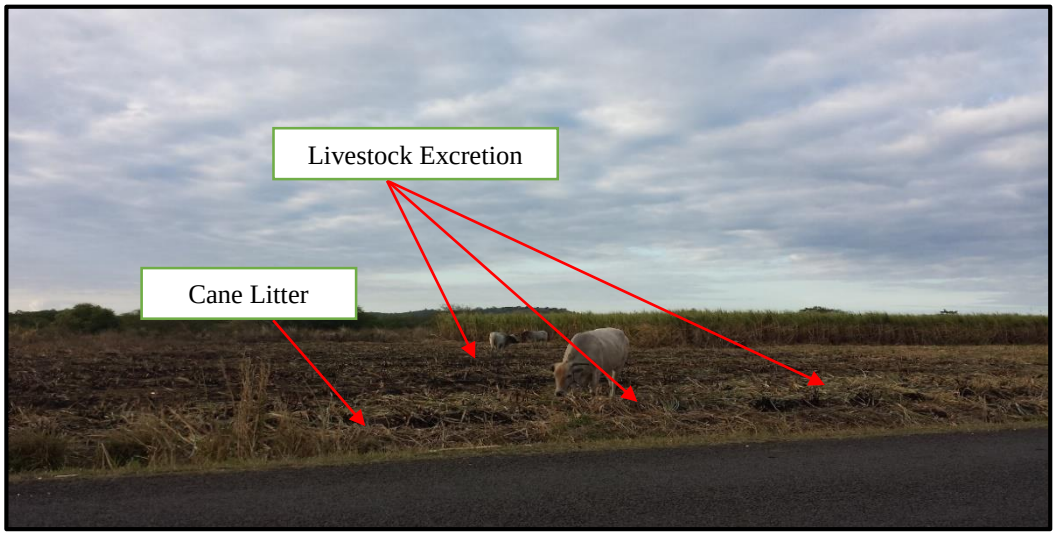

Figure 7.3: Cane field is mulched with livestock excretion and also with cane litter to increase soil fertility
Source: Author

7.3.3 De-trashing, Propping and Top Dressing

When the plant has grown to a height of around 14-16 inches, many farmers bend or twitch the *kantaap* (cane-top) and some go to the extent of hangering the entire farm again. Twitching the *kantaap* allows for germination of more leaves from that shoot. Farmers informed me that more leaves during this stage of plants growth assists healthier growth. The ultimate aim is to have shoots that are thicker, healthier and in good conditions, as this increases the tonnage of the cane.

Hangering the entire farm serves two purposes. Firstly, it allows for the *biaas* (germination of more shoots) and the clearing of the weeds *(churi chalao)* all at once. Hardworking farmers would use *fulawa* and *khurkhuraiya* (furrow) six times

and hanger about four times. However, if a farmer wants to avoid hard work and save energy, another method of de-trashing used in the cane fields involves twisting the tail of a horse and tying something heavy to it, then applying benzene to the rear of the horse, causing it to become furious and start running through the field - a practice that should not be allowed on the grounds of mistreatment of animals.

This process of de-trashing believed to accelerate the growth of the plant, and for plants that are re-germinating from the ratoon crop. Once the plants have reached their secondary growth stage, Blend B fertiliser recommended by the FSC and sold by SPFL is applied.

Once the cane plant has started to reach tertiary growth, the farmer needs to clean the leaves off the stalks of plants, commonly known as *baakham* in Vanua Levu-North Fiji, *patimaar* in Sigatoka-Nadi and Lautoka-Ba regions, and *patti girao* in the Tavua-Rakiraki region. Blend C fertiliser, is recommended by FSC and sold by SPFL for application at this time. The *baakham, patimaar* or *patti girao* process is to ensure that the cane stalks are continuously exposed to fresh air, and the leaves that are brought down by this process are left on the soil to help with moisture retention and cooling of the top soil. This is known as trash mulching in agricultural terms.

There are multiple benefits of trash mulching in sugarcane agriculture (Mendoza et al: 2016; 1987). The practice serves as soil amendment, increasing both sugar quality and tonnage leading to increased income for the growers (Abrigo: 1981). High quality yields are desired by the millers as this helps in increased milling efficiency. Deliveries of high quality cane to the mill help reduce the cost per unit of sugar manufactured by the millers (Mendoza et al: 2016; 2001). Mui et al (1997) found that trash (dead leaves) mulching increased sugar content of the cane by 11.6 percent. The practice of trash mulching also helped improve the sugar levels of the ratoon crops. In the Philippines, Delos and Mendoza (2002) found a 50 percent increase in sugar yields in trash-mulched canes compared to non-trashed farms. Trash farming also extended the ratooning cycle of the canes and helped improve its cost of production by reducing the cost of fertilizer usage and direct fossil fuel energy inputs.

7.4 Use of Environmental Indicators

Sugarcane farmers in Fiji rely on environmental indicators for various farming activities. For determining the optimum time for planting cane seedlings and other vegetable seeds, they rely on the phases of the moon. Farmers do not plant seeds during the days of full moonlight as it is said that the bright light of the moon attracts many pests and the seeds will not germinate.

When it comes to pest management, cane farmers in Fiji prefer dark nights of the month for planting any type of seedlings. In a study of the use of sex pheromone traps for the control of insect pests, Parajulee et al (1998) monitored the flight activity of the Corn Earworm (*Helicoverpa zea BODDIE*, 1850) and the Tobacco Budworm (*Heliothis virescens FABRICIUS*, 1777) for 15 years in Texas between 1982 and 1996. Their study concluded that the daily catch of the trap was influenced by lunar phases. It revealed a significant positive correlation between the catch and the percentile value of lunar illumination. The maximum daily catch of the trap occurred at full moon (71 percent), followed by the values of the first quarter (11 percent), last quarter (9 percent) and new moon (9 percent) (Nowinszky et al: 2015).

The moon is also used to identify weather patterns. Farmers informed me that they are able to ascertain whether there will be rain during the week by looking at the markings displayed on the moon. Farmers of the Hindu faith informed me that the birth date of the Lord Krishna usually coincides with extreme rainy conditions. This is something everyone in Fiji knows. The celebration of Krishna *Janmasthami* or *Asthami* always brings extremely heavy downpours. Conversely, a clear sky with many stars is indicative of clear bright sunny conditions for the next day.

In Fiji, during full moon light nights, the catching or buying of crabs and lobsters is not encouraged by the *Girmitiya* community, as it is thought that during those nights the crabs and the lobsters are devoid of meat. Farmers also advised that the inland migration of sea birds reflect harsh weather situation out in the ocean and therefore those farmers who live along the coasts do not go out fishing or crabbing during those days. Farming households who relied on the sea and the ocean for their livelihood relayed to me the same techniques of fishing and crabbing that were described to me during my previous research on the Marine Traditional Ecological

Knowledge (MTEK) for Marine Conservation and Management with the Indo-Fijian fishermen of the province of Rewa in Fiji (Dean: 2012a).

In weed management, not all weeds are removed. The *Lantana Sp.* and the *Ficus religiosa* (Sacred Fig Tree) is retained in the fields as it is thought to prevent the occurrence of pests and diseases. Cane growers also usually place the *Lantana Sp*. in the coops of the domesticated chickens during the brooding period, as the smell of the *Lantana Sp.* keeps the pests such as mites and litter beetle away (Field observation: 2015).

7.5 Traditional Methods of Increasing Yield

The traditional methods for increasing sugarcane production is through *sukhlai* and *tamtam*. *Sukhlai* is an activity that requires supplying the *bedh* (plot) with a germinating ratoon or a new seedling whenever there is a gap created by the failure on the labourer/planters side, the non-germination of new seedling in a newly prepared farm, or when the old ratoon has died completely. When the applied germinating ratoon crop fails to grow, the process of *sukhlai* may require the replanting of new seedlings altogether. The term *sukhlai* or *suplai* is derived from the original word 'supply' used during the CSR days. It actually means 'supplying new cane seedling to places where germinations were lacking'.

The second traditional method, *tamtam,* is done only using the *kuthi ganna* with its ratoon still intact. *Tamtam* is a process of removing half of an old ratoon with its shoots and stem still intact to the root system. This is then planted in places where a gap has been created. *Tamtam* is done by firstly digging a hole in places where there is a gap in the *bedh*, then filling the hole with water and placing in the *kuthi ganna* to fill the space. In comparison to *sukhlai, tamtam* is always carried out during rainy weather as the soil has high moisture content that ensures the binding of the root system to the soil and provides higher chances of survival. But, with both *sukhlai* and *tamtam,* you need at least one root and one shoot still intact for the plant to grow, and from then on the cane is left to germinate on its own.

Another method for increasing yield or intensifying the cane field is for every three to four foot of new cane seedling planted one can put three to four seedlings together in the same mound with the application of recommended fertilisers or natural fertilisers that the farmers make themselves. However, this method is seldom used.

7.6 Soil Management

According to the older generations of cane farmers who took part in this research, a farmer must know when to *parthi* his farm. The re-*parthi* of the entire field becomes necessary when it is observed that the farm is not strong enough to produce cane plants, or even if it is able to do so, the germinations will be distorted and consist of unhealthy stalks. A farm that can no longer produce acceptable levels of produce is known as *murda khet*, meaning that the farm is fully dead and cannot function anymore.

Those farmers who practice re-ploughing the soil in their fields every 3-5 years have soil that is not strong enough (*taasid nai rehwe*) compared to farmers who have not turned the soil over in their farms for at least 20-30 years, whose farm is still fertile and strong, commonly known as *sannaka khet*. The practice of re-ploughing illustrates that the *parthi* of the farm at the very beginning was not properly carried out. If *parthi* has been properly carried out in the beginning, then the farm should last for at-least 25 years before a turnover of the soils is needed. Irrespective, the farmers must turn over the soil every thirty years.

Similarly, the farmers have to be careful of the soil types on which they grow the sugarcane. For example, if the soil type is boggy, and its moisture retention capabilities are high, then the farmers have to invest in proper drainage systems within the rows in which the canes are planted, and around the field to avoid it getting flooded with rainwater. The retention of water in the fields has the potential to adversely affect the growth of the seedling and affect the strength of the soil and the root system of the cane plants. In Fiji, the cane farmers identify the feasibility of soil and the correct variety of cane suited to that soil type based on the colour of the soils. They identify them as black in colour, as brown, or reddish in colour, with all three having different physical properties. For instance, *Chintaani matti* (brownish to reddish in colour with non-porous sticky properties) is a type of soil in which the farmers stated it is difficult to grow the seedlings, because the properties of this soil type inhibits the sprouting of the cane seedling eye buds, hence killing the seedling over time.

7.7 Crop Variety Classification

Farmers revealed that it is extremely important to avoid planting different varieties of cane together. They related this to the characteristics of different varieties, whereby some sugarcane varieties may have tall stalks, some may have short stalks, while others may have thin stalks, and others thicker stalks. The properties of the *kantaap* also varies from one variety to the other. A mixture of different cane varieties in the same field would therefore cause the stems and the cane tops of the plant to clench or entangle together which would prove challenging during the harvesting season and also create competition for resources such as fertiliser, water, and sunshine when they are growing.

Further to this, the farmers in Fiji are able to identify the different crop varieties by employing locally classified taxonomic systems. This allows them to identify local crops, encouraging gene hybridization through the selection of appropriate hybrids, and do field tests and systematic recording of data, and employing local names for the different varieties of crops found on the farms (Veitayaki: 2002; 2004).

Sugarcane farmers in Fiji classify cane varieties based on the stalk colour and structure, leaf (*kantaap)* type, root system, flowering time and characteristics, stalk, smell, and taste. Moreover, the different varieties of cane are adapted to different soil types as well.

7.8 Traditional Methods of Harvesting the Cane

Figure 7.4: Early morning harvesting
Source: Author

Figure 7.5: Kuthi
Source: Author

Figure 7.6: Making rows of harvested canes for loading
Source: Author

Figure 7.7: Loading harvested cane onto cane lorry
Source: Authors

The majority of the cane farmers in Fiji are highly reliant on members of their gangs, external labourers or themselves for the harvesting of canes once it has matured. This is because of the high costs of harvesting using mechanical means, and because of the topography of the farms (refer Section 9.5).

The first process of harvesting cane includes the determination of the sugar content in the cane stalks. There are two traditional techniques of determining if the cane plant has reached maturity. Firstly, the farmer would count the number of *bali* (internodes) present on the cane stick, which should be at least a minimum of 13 *balis*, meaning that the number of *gullis* (nodes) present on the stem of the cane plant should be more than 13.

Another way to know if your cane has reached its maximum potential for harvesting is by making careful observations of the cane stems. Farmers informed me that when cane is ready for harvesting the sugarcane stems will become highly smooth and if one bends the cane and breaks it, it makes a particular sound that resembles the breaking of dry branches from a tree. If the cane plant breaks with a lot of *khujji*

Figure 7.8: Fully stacked cane lorry
Source: Author

Figure 7.9: Transportation of harvests by tractor
Source: Author

Figure 7.10: Transportation of harvests by FSC trains
Source: Author

Figure 7.11: Burning of crop residues
Source: Author

(grains) and with a mild sound, this means that the soil in the field is weak and the health of the plant has been compromised with negative consequences for the content of sucrose. The maturation of the canes is counter checked by the FSC officials using a Brix meter to verify that the cane has reached its maximum sweetness or sucrose content for harvesting. The percentage obtained through the Brix meter (commonly known as *sui* due to the injection of needle into the sugarcane to determine the sucrose levels) is a measure of the sucrose present in the cane plants. The amount and quality of sucrose is dependent on many factors such as altitude, temperature, fertility levels and different properties of soil, climate types and yield management. Different cane varieties have different types of sucrose contents.

A 23 percent Brix measurement is considered to produce the highest quality of sucrose (SRIF: 2015, Semi-structured Interview). If the cane is not harvested in time and is left to flower, it is said that the cane has passed its productive stage and has now grown old. Once the flowering state has been reached, the cane plant tends to lose its value in terms of the quality and the quantity of sucrose content.

As soon as the canes have been confirmed for the correct measurement of the sucrose content, the FSC provides quota slips to the Gang *sirdar* for the harvesting to be initiated for the farmer concerned. The *sirdar* would then prepare his team, and with the farmer, decide on the number of labourers from the gang that will be involved in harvesting, and, if needed, many additional labourers are sourced from outside.

The *paniwala* is also appointed, whose role is to provide refreshments such as tea, water and eatables to the harvesting team. A *hukmaan* is also appointed to oversee the work carried out by the team while the *sirdar* is away performing other duties. The *sirdar* also appoints *pakki line* men whose role is to keep clearing the lines for loading the harvested canes onto the cane carts, and all members are briefed on their roles and tasks usually a day before harvesting. However, it is important to note that different gangs have different methods of dividing labour amongst their members.

Usually, the manual harvesting of cane starts as early as 4-5am. This is because of the scorching sun and heat that would affect the process later in the day. Cane cutters take maximum advantage of the early morning hours to harvest as much as possible (refer Figure 7.4). Later, during the day, when the sun is high, the cutters would move to start harvesting cane from the opposite direction to the sun so the cane plants provide them with shade. Harvesting begins with the most experienced cane cutters starting the first *bhalo* of the *dharis* (manual opening or cutting of the cane assemblages), followed by the lesser experienced cutters before a uniformed pattern of harvesting is achieved.

The cutters have to ensure that they leave at least 3 inches of *kuthi* (stem) attached to the root system and not cut the entire stalk at ground level (refer Figure 7.5). This is to ensure that the remaining cane *kuthis* are exposed to air, light and water to accelerate the re-growth of the canes for the next season, now known as the ratoon crop. The cane cutters must also ensure that the already cut canes are placed in rows in an orderly fashion making it easier for the *pakki line* men to stack them onto the trucks or the carts for transferring to the mills. They have to ensure that when they make these rows, the bottom part of the cut cane stalk faces inwards while the *kantaap* end faces outwards as they are being placed on the ground (refer Figure 7.6). This is so when the *pakki line* men stack the harvest on the trucks or carts, it is easier for them to flip the *kantaap* end to the middle of the tray of transfer vehicle.

While stacking the harvest, the *pakki line* men must ensure that the ground end of the stalk is facing outwards from the sides of the carting vehicle (refer Figures 7.7 and 7.8). This strategy puts the weight onto the truck or cart wheels so that the vehicle is able to maintain its balance while heavy loads of harvest are transferred to the mills via roads and tramlines (refer Figures 7.9 and 7.10). The dimensions of cane load on the trays of the trucks are dictated by the Land Transport Authority (LTA) of Fiji while the dimensions of cane loading onto the train carts are dictated by the FSC through the Master Award. A farmer in Labasa told me that two fully loaded trucks are made to collide with each other at their rear ends in order to force the stacked canes inwards on the truck trays and for stronger fastening of the cables. Then the fully loaded trucks make 4 or 5 fast rounds on the roads to tighten the cables and avoid spillage of cane during the transportation.

Once all the cane has been fully harvested and transported to the mills, some farmers burn the remaining materials/litter on their farms (refer Figure 7.11) whilst majority utilise this as fodder for their animals, or leave it to decay as mulch. Kumar and Goh (1999) and Erenstein (2003) assert that mulching typically conserves soil and water retention that can potentially assist in boosting and stabilising crop productivity in water constrained settings. This is true of the cane belts of Fiji that continuously face drought and dry spells, and could be a reason why farmers prefer mulching. The remaining litter also assists in preventing the erosion of soil from wind or rain once it has become exposed due to the harvesting of the cane.

Farmers who burn the unwanted materials say that this practice clears the land quickly of weeds, pests, and other things, and allows them more time to work on their farms for the next season. Those farmers who do not burn the wastes said that the natural decay of the litter adds additional natural fertiliser to the soil, although burning added ash to the soil, which is a source of minerals in the newly gardened areas.

Not only does the above practice help in the control of weeds, it also helps the sugarcane farmers in reducing the usage of chemical pesticides that have both financial and health disadvantages. A study conducted by Szmedra (1999) amongst the smallholder cane farming communities of Fiji found that 35 percent of his survey population were able to link pesticide exposure to acute episodes of ill health and reported a median loss of half of all work days per year due to the effects of

pesticide ‘poisoning’. The farmers displayed acute pesticide symptoms as a direct result of pesticide exposure including headache, rash, blurred vision, difficulty in breathing, skin lesions and tingling in fingers.

A number of herbicides commonly used in the cane belts of Fiji are categorised as toxicity level II (moderately hazardous) or III (slightly hazardous) and so have the potential to affect negatively the health of those exposed to them directly or indirectly. Included amongst these are paraquat (Class II), 2-4-D (Class II) and Diuron (Class III). In Fiji, up to 50 percent of the sugarcane farmers have to resort to herbicides for weed control on their fields to avoid the problems associated with labour availability at times of peak demand, and in dealing with ‘moral hazards’- i.e., how to motivate day labours to perform efficiently and effectively (Szmedra: 1999).

7.9 Use of Livestock

The use of livestock such as the bullocks is a very common practice for those smallholder sugarcane farmers in Fiji who live on scattered farmlands and are also not able to afford mechanical equipment. Farmers keep cattle to use on the farm for tillage and other purpose. The same bullocks may be used for ploughing and for transporting of goods and materials from one point to the other; as in the case of the Figures 7.12 and 7.13, where the same pair of bullocks are used for ploughing and the transportation of materials by *ghaseeta* (sled pulled by bullocks). The bullocks also serve in taking the produce out of the field as in case of Figure 7.14.

Horses are also used for ploughing, though their use differs from that of bullocks. Horses make extremely straight *pahis* while bullocks tend to make *pahis* that are a bit slanting. Farmers stated that horses are favoured over bullocks on flat land while bullocks are favoured over horses on the hilly terrains.

Figure 7.12: Transportation of fertilizer
Source: Rakiraki Farmer

Figure 7.13: Bullocks used for farming
Source: Author

Figure 7.14: Removal of harvest using bullocks
Source: Author

Figure 7.15: Domestication of cattle for food
Source: Author

One problem with the use of bullocks and horse, as pointed out in a recent review by Bell et al (2011), is that the treading of these animals reduces macro-porosity and infiltration rate of the soil. At the same time, however, the treading of animals increases soil strength and bulk density. Although these effects are mostly confined to the soil surface (<0.1m) and are short lived due to amelioration through tillage or natural processes.

Cattle and other livestock, such as goat, sheep, pigs and poultry also act as food security during hard times. Farmers either sell them or use them for food (refer Figure 7.15). Products from livestock serves many other purposes. Milk from cows is consumed as is, or used for making curd and yoghurt. It is also used as medicine for eye and skin diseases. The skins of the goats are dried and sold for making musical instruments. Those farmers following the Hindu religion do not consume beef meat but sell their cattle for additional income. Farmers who follow the Muslim faith do not keep pigs.

7.10 The Use of Medicinal Plants and Beliefs in the Supernatural

Medicinal plants are freely available in the surrounding areas of the farmer households, and in the cane fields. Certain plants are sourced for their barks, shoots, roots and stems for curing different types of ailments. The knowledge of their preparation and use is passed down the lineage from one generation to another and is usually not publically known, while other medicines may be commonly used throughout the country. Some medicines are derived from single plants while others are a mixture of different plants. For example, cuts and sores can be easily treated with the mile-a-minute plant or coconut oil, whereas a combination of turmeric powder and chilly leaves is used for curing boils and abscesses.

Other medicines may be applied in abstention from certain food and activities with varied conditions. For example, guava plant shoots are used for curing stomach pains in absentia of food consumption. Such forms of medicine are cheap, readily available and easily accessible, and are used by the sick before medical attention can be sought, which is only available far away in the towns and cities.

Other acts connecting to nature can also heal people. For example, if someone is suffering from headaches, he or she has to wake up early in the morning, or during the sunset, and face the sun with a coconut tree in front of him/her, touch the stem with his/her forehead seven times, and say *'jaha se aya hai waha pe laut jao'* (wherever you originated from, go back to your original place). This has to be done while no one is present or watching the sick person. Similarly, if someone is suffering an eye illness, sty and pus, commonly known as *bilni*, they can get rid of it quickly if they touch the infected eye with Gold seven times every day. In the *Girmitiya* Muslim family, those suffering eye diseases, such as red eye, can apply milk of a lactating mother every morning and evening for three days, after which the disease will be cured. The lactating mother has to recite *'Allah Shafi, Allah mafi'* every time she pours the milk into the eye of the sick person. This means 'O God Allah please provide *shifa* (cure) and *maaf* (forgive) me that I have offered my milk to the sick person who is unknown to me'.

Other examples include the use of the Supernatural for healing. This subject was not a specific focus of the research, but certain observations of it were made during the participant observation phase of the research. At one time I was part of an *iSevusevu* ritual being performed for the *Taukei* (Land) God by one of the descendants of the *Girmitiya* in the village where I was staying during my fieldwork in Lautoka. The process involved the offering of tea, fish cooked in *lolo* (coconut cream), cassava, bread with butter, tobacco and Kava to the *iTaukei* God for seeking his assistance in solving an individual's problem concerning health. The person performing the ritual had blessed some oil and leaves through the powers of the land God and handed it to the sick person. A few days later, I heard that the sick person had started to get better.

There are people who are considered to have magical powers associated with gods and ancestral spirits who possess healing powers. These magical healers are well-known in the community. It is said that the gods only become part of their life because they like them. My father and two of my uncles who were fishermen had these gods. My father had the sea god that he described as a long shiny eel that would accompany him and safeguard them during their fishing trips out at sea. My uncles described the God as a person almost the size of an electric pole that would assist him and the others who sought his assistance. Currently, one of my uncle

resident in Aotearoa/New Zealand informed me that the God followed him there when he migrated. The one thing that is common among these Gods are that they have to be offered *iSevusevu* with Kava. The Kava is presented to them as *iSevusevu* in the sea if they are sea gods, or on the land if they are the land gods. These magical healers are approached often by the local community seeking help or solutions to their problems.

There are certain restrictions on behaviour in places that are considered sacred. These are known as the dwellings of spirits, dead people, certain gods, and ferries. Everyone must observe a 'code of conduct' when passing by these places or visiting them, as they form important parts of the people's property and fields. During my fieldwork I came across certain rituals in *Girmitiya* Muslim community, such as the offering of goat's blood to the *bade peer* (a Muslim Seer) as a means of sacrifice for the well-being of the household and their families, and for good production on their farms. I was also part of a ritual known as *raatib* being performed by one of the Muslim sects (commonly practiced by the *Maryalam Muslim* community in Fiji) living near the village where I was based in Lautoka, for curing of diseases. The process involved cutting people and curing them with a knife with the blessing of God. After the ritual, everyone was given small amounts of oil which had been blessed by the *molbih/mullah* (a Muslim priest) to apply to their bodies for good health and wealth. A large feast awaited the people who attended the ceremony which ended with *sinni* (refreshments such as *halwa, misri,* fruits, etc.) and Fiji Muslim style cooked *pulau,* usually made of goat meat.

On another occasion in Labasa, I was part of a sitting where a *molbih* was able to communicate with the dead ancestor of a person who turned up with a problem that he was faced with. The person with the problem went into a state of sleep, and was able to speak to the dead people in his family and seek their assistance in solving his problem. The *molbih* had offered the dead people *ittar* (natural perfume usually worn by the Muslims around the world) as a way of calling them over, chanted beads using *aayats* from the Quran as their food, water and strength, and finally providing the person with water mixed with sugar for sending the deceased back to their graveyards.

Many farmers described the use of different substances for avoiding the powers of the devil. For example, keeping of the horseshoe in the house prevents the devils from getting into their houses. In *Girmit* Muslim marriages, usually the bride and the groom has a miniature knife affixed inside their clothes before their *nikaah* (religious marriage/bonding) has taken place. It is said that the knife will protect them both from the demons, evil Jinn, or any other form of spirits present during the marriage ceremony, and they have to keep wearing the knives until their first nuptial. It is said that there are chances that such forms of evil can become part of either of them and cause problem later on in their lives. The *Girmitiya* people are also asked to keep a knife under their mattress if they continuously face nightmares and bad dreams in the nights.

The practices described above need to be considered in terms of the close relationship that exists between socio-cultural and agroecological systems (Thandee, 1986). This is because ITK is the product and property of a cultural community and can only be preserved and developed if the community is also preserved. Systems of belief, cultural ceremonies and ritual practices of the type described above are what provided a community with its identity and solidarity and hence are important aspects of what makes the ITK of sugarcane farmers available for use as an important resource for the sustainability of the sugarcane industry.

7.11 Discussion

The traditional methods of sugarcane farming practiced by cane farmers in Fiji is highly reflective of 'conservation agriculture', more commonly known as 'sustainable agriculture'. Hobbs et al (2008) define Conservation Agriculture as: (a) retaining full or close ground cover, (b) no soil compacting or disturbance and (c) maintaining diverse crop rotations. Such strategies are applied to reduce wind and water erosion of topsoil, increasing water use efficiency through improved water retention and infiltration, increasing nutrient use efficiency through enhanced nutrient cycling and fertiliser placements adjacent to seed, reducing oscillation of surface soil temperatures, increasing soil organic matter and diverse soil biology, reducing fuel, labour and overall crop establishment costs, and more timely operations (FAO: 2002; Kassam et al: 2009).

Altieri (1995), Gliessman (2007), and Thierfelder (2015) state that the successful promotion of Conservation Agriculture from a scientific view point would require the agro-systems to be adapted to the smallholders' circumstances. For the sugarcane growers, the decisions they make are the result of a closer analysis of these circumstances during their long involvement with the industry, and the natural and cultural surrounding that are dear to them.

According to Muthuraman (1995), success in promoting sustainable agriculture can be achieved through components such as genetic diversity, crop diversification, integrated nutrient management, integrated pest management, and sustainable water management. These are components of what has been described throughout this chapter as part of the traditional practice of smallholder sugarcane growers in Fiji. Therefore, in the interest of the productive, environmental, and socio-economic sustainability of the sugar industry in Fiji, there is an urgent need to retain and build upon this sugarcane grower knowledge. This would involve empowering the farmers to utilize their knowledge in ways that they believe to be most productive to them. In this respect, the industry restructuring and legislative reforms currently being considered as solutions to the problems facing the sugar industry in Fiji can be critically assessed in terms of how supportive they are to the empowerment of farmer knowledge.

7.12 Chapter Summary

This chapter documents the ITK of descendants of the *Girmitiya* community who are currently involved in sugarcane farming in Fiji. It represents the vast repositories of technical knowledge that has been accumulated for over more than a century, since the beginning of indenture system in 1879, and that is vital to the operation of the sugar industry. It is called 'indigenous' because it has been generated via practical approaches adapted to the unique environmental conditions of sugarcane farming in Fiji, and because its holders are (mostly) members of the *Girmitiya* community, which is indigenous to Fiji in the sense of having originated there out of unique historical circumstances. The next chapter documents the serious problems facing the sugar industry in Fiji today, and looks in particular at the livelihood consequences of this for smallholder sugarcane growers.

Chapter 8 Problems Facing the Fiji Sugar Industry Today

8.1 Introduction

"Sugarcane is not an incidental crop that can easily be replaced. It is a primary agricultural export, at the very core of our economy and the lifeblood of huge segments of our population"

(The Prime Minister and the Minister for Sugar - Fiji at the 43rd International Sugar Organization Council Meeting, London, 2013)

This chapter discusses the problems facing the sugar industry in Fiji, as informed by research participants representing the Ministry of Sugar (MoS) and Ministry of Agriculture (MoA), the associated stakeholder institutions (FSC, SCGC, SRIF, LCPA, FT, SAG, SPC/EU, *i*TLTB), and the smallholder sugarcane farmers in Fiji. The chapter answers the research question; what is the nature of the current crisis facing the sugar industry in Fiji and what are its causes.

The chapter is divided into three parts. Part One describes the problems of world trade, and Part Two discusses the problems of production. Most of the data in these two sections was obtained from semi-structured interviews with participants from the MoS, MoA, and other institutional industry stakeholders. Information was also gathered from relevant literature and documentary sources. Part Three provides an overview of the problems specifically facing farmers. The information here was gathered during focus group discussions, livelihood surveys, participant observation, informal farmer interviews, and agroecosystem analyses. A chapter summary forms the final section.

8.2 Part One: Problems of World Trade

The problems of world trade identified by research participants from the MoS and MoA, and other institutional industry stakeholders were those of loss of market access; end of FairTrade (FT) premium; fluctuating market prices; and the geographical isolation of Fiji from other countries of the world.

8.2.1 Loss of Market Access

Since 1975, Fiji had been exporting sugar to the UK and EEC/EU under the Lomé Convention preferential quota agreements. Under this agreement, Fiji enjoyed premiums of up to three times the normal world market price of sugar. Production in excess of the preferential quota was sold under bilateral agreements with Aotearoa/New Zealand, Indonesia, Malaysia, Japan, South Korea, China and Canada, at the world market prices (FSC: 2012; 2013; 2014). The Lomé Convention expired however in 2000.

After 2000, Fiji entered into the Cotonou Agreement in Benin in 2000 (Delegation of the European Union for the Pacific: 2013). The most important aspect of this agreement was the 'Sugar Protocol'[26] under which African, Caribbean and Pacific (ACP) countries were guaranteed EU price support for a limited quantity of their sugar exports.

The Cotonou Agreement expired in 2007, to be replaced by an Interim Economic Partnership Agreement (EPA) with the EU. The main aim of this agreement was to stimulate cooperation between the EU and ACP countries, such as Fiji, in order to achieve the highest possible degree of self-reliance, contribute to ACP regional integration, and create more effective regional markets. This was to be done by improving trade, preventing conflicts, building autonomous capacity, fostering sustainable development of land and sea resources, and the improvement of health and educational facilities.

[26] The Sugar Protocol is a bilateral agreement between certain ACP states (Barbados, Belize, Republic of Congo (Brazzaville), Côte d'Ivoire, Fiji, Guyana, Jamaica, Kenya, Madagascar, Malawi, Mauritius, Mozambique, St Christopher and Nevis, Swaziland, Suriname, Tanzania, Trinidad and Tobago, Uganda, Zambia and Zimbabwe) and the European Communities (EC). It was agreed in 1975, alongside with the first Lomé Convention. In the framework of the Sugar Protocol, the EC had obliged 'for an indefinite period to purchase and import, at guaranteed prices, specific quantities of cane sugar, raw or white, which originate in the ACP states who are members to the protocols'. The ACP states, on their side, had undertaken to deliver the agreed quantities. However, the protocol did not oblige the EC to subsidize re-exports of 'ACP equivalent' sugar and nor are the pricing arrangements for purchase of sugar linked in any way to exports of 'ACP equivalent', and to the provision of export subsidies by the EC.

Under the EPA, approximately €120 million was to be channelled to Fiji between 2007 and 2013 to support economic diversification within the sugar sector and provide social mitigation measures (Andersson and Jenshagen: 2010). This development funding had to be implemented in project or program forms, with separate funding for the sugar sector primarily for increasing productivity.

By signing the Cotonou Agreement, Fiji committed itself to an EU referendum concerning human rights, democratic principles and the rule of law, and these remained essential elements of the ACP-EU Partnership Agreement of 2007. Due to the military takeover in Fiji in 2006, however, which the EU considered a violation of democracy and the rule of law, Fiji was seen as failing to honour its commitments (Fiji Cane Growers Association: 2016). This led to the EU cancelling the sugar aid allocations under the European Development Program for the years 2007 to 2009. Thereafter, the sugar allocation for 2010 depended on how the democratisation process in Fiji proceeded. Although there were major cuts to funding from the EU during this period, an indicative amount of €28 million was allocated for Fiji under the 11th European Development Fund covering the period 2014-2020 (European External Action Service: 2016), the focal areas for this assistance being Sustainable Rural Livelihoods and Public Administration Reform and Governance.

In 2006, the EU had announced that Fiji, together with the other ACP member countries, would lose their preferential access to the EU market when the EU withdrew this benefit from ACP member states in 2006/07 (Chaudhary: 2015b). In the meantime, there would be a transition period for Fiji from 2012 until September 2017[27]. Thereafter, the EU would open up its markets to all ACP products, and guaranteed prices would be phased out with ACP producers being treated the same as European producers. This would give all ACP member countries free access to

[27] Under pressure from the World Trade Organization (WTO), the EU agreed to reform its policies toward sugar in 2001, with the full effect of the reforms being fully implemented in 2006. In September 2007, the EU denounced the sugar protocol, for two reasons; (i) EU policy-makers wanted to take pressure off the over-supplied domestic market which had proven to be relatively resistant to initial reforms and (ii) there was increasing doubt whether the sugar protocol would withstand legal challenges under WTO law if upheld for indefinite duration (Moyo, S. and Spreen, T. H. 2011. An Update on the Consequences of EU Sugar Reform. *International Journal on Food System Dynamics*, 02.).

the markets in EU, but with a safeguard clause that exports from the ACP countries into EU should not result in the destabilisation of the EU market.

The end of the EU preferential quota will have serious implications for the world market price of sugar, the FSC and the cane growers. The FSC Executive Chairman, Mr Abdul Khan stated that "it is no secret the end of preferential quota access to the EU market in September 2017 would affect the industry……we had to borrow $14 million this year to maintain the FJ$80 per tonne price to growers but it will get increasingly difficult to do this" (Chaudhary: 2015g).

The National Farmers Union General Secretary and former Prime Minister of Fiji, Mahendra Chaudhry, has stated that "post 2017, we will have to compete with ACP sugar producing countries who are also sharing the same fate as Fiji with the end of the EU preferential market access" (Chaudhary: 2015i).

While the EU has pledged €1.24 billion to help those countries who were part of the 'sugar protocol' adapt to the falling European prices (Andersson and Jenshagen: 2010), the end of the EU preferential quota, coupled with the other challenges that the country is faced with, will create extreme pressure on the sugar industry in Fiji and will put the country and its sugar industry stakeholders in a very difficult position. The research respondent at the MoS stated that there is little time left for ACP countries like Fiji to pursue alternative markets (MoS: 2015, Semi-structured Interview).

Farmers also have expressed concern about the end of the EU preferential quota and wanted to hear from me my perception on the situation of the cane industry in Fiji once the preferential quota access comes to an end in 2017. It was Tuesday, 31st of March 2015, and I was convening my first focus group discussion in Labasa, on the island of Vanua Levu - the second largest island of Fiji on which sugarcane is grown.

The group consisted of participants from diverse backgrounds comprising a cane Sector Officer, an officer from the LCPA, FT officer, FSC Field Officer, cane cutters, cane lorry drivers, farmers and their family members.

> When discussing the EU preferential erosion, I felt an atmosphere of doubt and uncertainty surrounding the cane industry. The FSC Field Officer was explaining how to increase productivity in the cane fields. His idea was based on the assumption that sugarcane farmers need to engage with intensive farming practices to increase production. In fact, the FSC Field Officer had experimented with a trial and error method with a grower on his farm. According to him, it proved successful. He then deliberated on the need to change from traditional single row cane planting to double row cane planting. However, while many farmers had noted this change, many were still in doubts, and later revealed to me in person that they would still want to continue with their traditional methods of planting and growing canes (Reflective Journal Entry: 2015).

At another focus group discussion in Labasa I overheard two farmers discussing whether they should ask me a question.

> One says to the other…hang on…I am going to ask him (referring to me) whether the hurricane that has just left would have affected the farmers more or the new hurricane (referring to the end of Fijis access to EU sugar quota in 2017) would have a greater impact…(Diary Entry: 2015).

I said to them that the 'hurricane' (referring to the end of preferential access) has been building for many years, and the time has now come for it to show its strength. From this focus group I learned that the farmers had started to feel the impacts of the EU quota saga already, and had started to believe that their future in the sugarcane industry looks gloomy, but they seemed reluctant to talk about it openly. They were speaking openly about the issues until the FSC Field Officer came in.

> …suddenly one of the participant tells everyone including me that the FSC Field Officer was here, and we should change topics [*"shhh…shhh…collumber aye ge…baat band karo…"*] (Reflective Journal Entry: 2015).

8.2.2 End of FairTrade (FT) Premium

In addition to receiving preferential access to the EU market, Fiji has since 2010, been receiving a FairTrade (FT) premium for its sugar. FT certification of sugar in Fiji started with the cane growers living on the island of Vanua Levu in the northern region (LCPA: 2015, Semi-structured Interview). In 2012, the Secretariat of the Pacific Community (SPC) carried out research that found that FT certification was producing significant economic benefits for the growers, and for the northern region of Fiji as a whole. The report estimated that the economic impact of FT certification of all farmers serving the Labasa sugar mill in Vanua Levu amounted to FJ$9,094,473, taking into account all costs and benefits over a 12-year period. "This represents a return of FJ$6.48 for every dollar spent on gaining certification, including those spent by farmers and donors - the EU, which is the principal contributor, as well as SPC" (Island Business: 2012).

The subsequent extension of FT certification to other sugar mills of Fiji brought in several millions dollar worth of additional income to the cane growers at relatively low cost, and provided associated benefits for many years, but in 2015 FT suddenly announced that they will no longer be paying premiums from the sale of sugar.

The imminent ending of FT premiums in 2016 is calculated to result in a FJ$13 million loss of income from the traditional sugar buyers Tate & Lyle (Chaudhary: 2015d). This is a concern for the approximately 13000 growers who have FT certification, and will be a serious setback for community development projects that have been benefitting families in the cane belt areas for the past four years.

The FJ$25 million premia that have been received over the past four years since 2011 from the sales of sugar registered as FT products has assisted farmers to reduce their costs by providing subsidies for farming equipment, improving drainage systems and purchasing of fertilisers. The decision by Tate & Lyle of the UK to withdraw from their commitment to buy 100,000 tonnes of sugar at FT premium means that FSC will now have to sell the FT certified sugar on other markets. Both the MoS and the farmers stated that it will be a huge task to replace a buyer such as Tate & Lyle.

8.2.3 Fluctuating Market Prices

With the withdrawal of preferential EU access and FT premiums, Fiji will be dependent upon fluctuating world market prices. In 2011, sugar was sold at close to US$0.20 per pound, but decreased to US$0.09 per pound in 2015. Such fluctuations are of concern to FSC. During the period of 2011-2015, Fiji had been trying its best to attain the world sugar price, with the Government topping up the payments made to the growers by the FSC. This topping-up was to help increase farmer motivation. Domestic consumers have to pay the world market price for sugar also, as there is no protection for the commodity locally.

In the opening of the 13th ACP Ministerial Conference on Sugar in Sigatoka, Fiji, the Prime Minister of Fiji said that:

> The global environment for sugar is characterised by higher production costs and lower world market prices. This means that there is a need for understanding and a fair deal from the EU countries. Similarly, the sugar producers have been denied adequate support for the negotiations on the sugar protocol of the EU's Economic Partnership Agreements (EPA). He said the negotiations have been long and drawn out with many non-trade issues tacked on. There is further uncertainty with the premature end to market access in 2017 that could prove disastrous for the livelihoods of many people in ACP countries. The sugar producers wanted this pushed back to 2020 to allow for restructuring but this has been ignored by the EU (Ministry of Communications, The Fijian Government: 2013).

Throughout all these years, farmers have not been able to meet their on-farm expenses, and costs associated with harvesting and cartage of cane to the mill. With the loss of market access, price preferences and FT premiums, the ability of farmers to meet production costs will be further weakened.

The FSC executive chairman, Abdul Khan, stresses in 2015 that:

> "Although the world sugar price was not favourable at the moment, FSC was working out how best they can deliver a good cane price to farmers to maintain their confidence in the industry, and, apart from volatile global prices, the price farmers received for their cane was also affected by

shipping costs and schedules, molasses prices, and the negative currency movements" (Chaudhary: 2015h).

8.2.4 Geographical Isolation

Like the other small countries in the Pacific, Fiji is a victim of the oppression of distance (refer Figure 8.1). Small domestic markets and geographical remoteness are large barriers to economic development. High transportation costs tend to restrain trade within the region, as well with international markets.

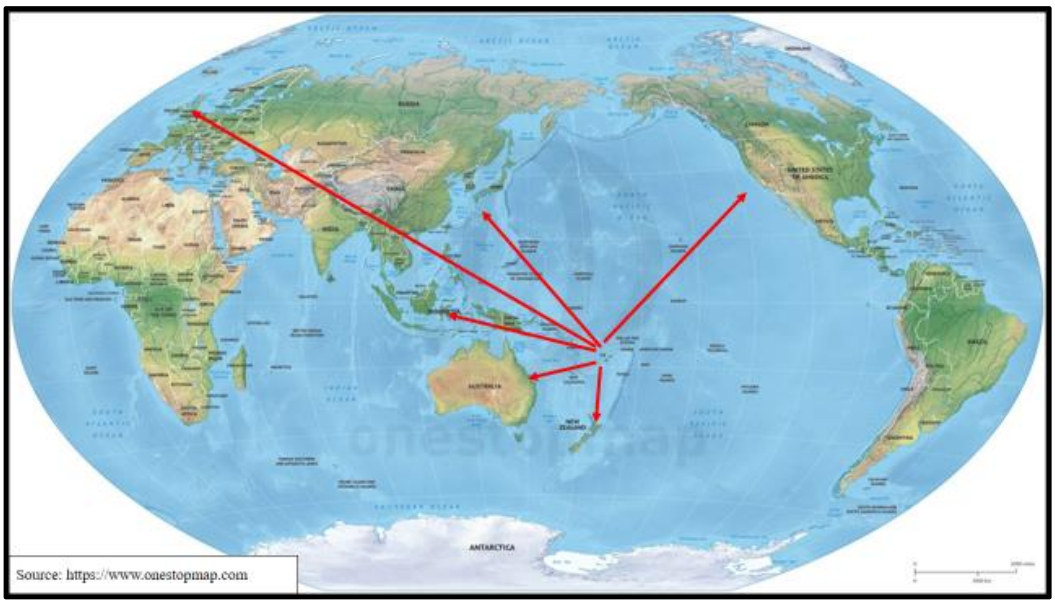

Figure 8.1: Sugar trade out of Fiji

For Fiji, the sole sugar producing country in the South Pacific, isolation has serious implications for its sugar industry and farmers in general. Compared to other sugar producers who are in closer proximity to global markets, Fiji's isolation puts it at a disadvantage. With the end of EU preferential access, Fiji's isolation will add to its difficulties in developing alternative markets.

Fiji is also very remote from the world producers of oil, and this raises the cost of fuel for farm machinery, such as tractors to work the farms, and generators for producing household electricity (MoS: 2015, Semi-structured Interview).

Other small ACP sugar producing countries, such as Belize, have also been affected by problems of world trade. The Belize sugar industry is experiencing the same level of price uncertainty as Fiji, with weaker sugar prices expected in the future (Morris et al: 2017). This also has been attributed mainly to the reform of the EU's sugar regime, and, to a fall in global demand for sugar, coupled with competition

from much larger producers, such as Brazil, India, China, United States, Thailand and Australia (Periris et al: 2012). The largest share of Belize's sugar has traditionally been exported to the EU market, making its sugar industry, like that of Fiji's, highly vulnerable to changes in EU demand. While Belize has available to it other preferential markets, including the USA, Caricom and the FT market, unless Belize's sugar exporters can achieve a larger share of such markets, any increase in output in the coming years will have to be sold on the free market at a lower price, thereby contributing to a decline in the average price for the country's sugar exports (Morris et al: 2017).

8.3 Part Two: Problems of Production

The major problems of production identified as facing the Fiji sugar industry are: declining farm production; declining farmer numbers; loss of farmer confidence; the loss of productive farm land to urban development; milling inefficiencies; and climatic factors, pests and diseases.

8.3.1 Declining Farm Production

In the last 20 years, Fiji's sugarcane production has declined by more than half, from the 4.064251 metric tonnes of sugar produced in 1994 (SRIF: 2015, Semi-structured Interview) to 1.832163 metric tonnes of sugar produced in 2014 (refer Figure 8.2) (SCGC: 2016). The number of registered growers has also declined, from 22807 in 1994 (SRIF: 2015, Semi-structured Interview) to 15528 in 2013, of which only 12633 were active growers (FSC: 2014).

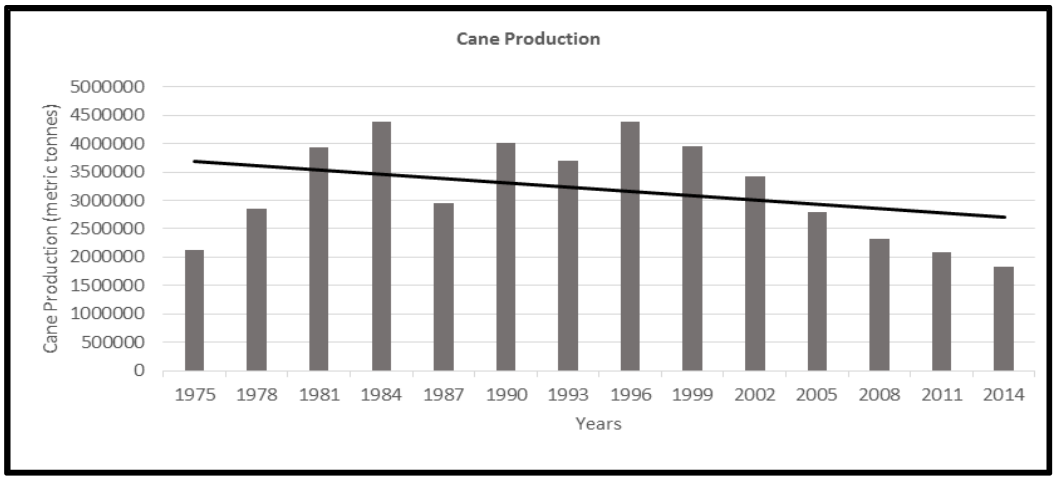

Figure 8.2: Cane production Vs Years
Source: SRIF

The total area under cultivation has also decreased, from 74,388 hectares in 1994 (SRIF: 2015, Semi-structured Interview) to 38,248 hectares in 2013 (FSC: 2014). While there was an upward trend in the area under cultivation prior to 1990, after 1990 it has nose-dived. This was brought about by a decline in the number of cane farmers, whose farm leases began to expire in 1997. As a result of nothing being done to assist these farmers to renew their farm leases, many others have lost confidence in the sugar industry (MoS: 2015, Semi-structured Interview).

One of the results of declining production has been Fiji closing its export doors to other international markets in order to keep up with the demands of the UK/EU. The FSC (2013) reported that in 2007, 9,157 and 20,000 tonnes of sugar were exported to the USA and the Japanese markets respectively. The last export to China and Portugal was in 2003, amounting to 25,000 tonnes and 17,000 tonnes respectively. Similarly, the last export to Indonesia was of 25,425 tonnes in 2004 (refer Table 8:1). Local consumption of sugar in Fiji is around 40,000 tonnes per year (Chand: 2005).

The loss of overseas markets has been the result of Fiji and/or FSC being too focused on the EU and UK markets, which pay two to three times more than the world market price. But even there, Fiji has never been able to reach the maximum allowance quota of 220,000 tonnes per year (refer Table 8.1).

Sugar Export Destination and Quantities (metric tonnes)

Season	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003
UK/EU	143,707	135,462	110,731	152,906	207,575	187,858	209,053	178,905	170,742	167,585
Malaysia	-	-	-	-	-	-	-	-	-	-
USA	-	-	-	-	-	9,157	13,442	10,111	9,006	9,061
Japan	-	-	-	-	-	20,000	40,000	57,481	62,000	37,008
Korea	-	-	-	-	-	-	-	-	-	-
China	-	-	-	-	-	-	-	-	-	25,000
Indonesia	-	-	-	-	-	-	-	-	25,425	-
Sp. Pref. Agreement	-	-	-	-	-	-	-	-	6,475	-
Taiwan	-	-	-	-	-	-	-	-	-	-
Portugal	-	-	-	-	-	-	-	-	-	17,000
TOTAL	**143,707**	**135,462**	**110,731**	**152,906**	**207,575**	**217,015**	**262,495**	**246,497**	**273,648**	**255,654**

Table 8.1: Sugar export destination and quantities (metric tonnes)
Source : FSC (2013)

The decline in production levels and failure to reach maximum quota allowances has been attributed to the falling grower numbers.

8.3.2 Declining Farmer Numbers

A major fear of the MoA and MoS is that fewer people now regard agriculture an attractive occupation in Fiji (refer Figure 8.3). Both ministries noted the demographic shift away from agriculture to be a global trend affecting almost every agricultural economy. The research participant from the MoA stated that the current generation in Fiji do not see farming as attractive as opportunities in the urban areas.

> *"Even if we try to make agriculture more attractive and sexy, people find other things sexier in the urban centres".* The amount of time and energy invested by individual person living and working on his farm will be double that invested in doing jobs at urban centres (MoA: 2015, Semi-structured Interview).

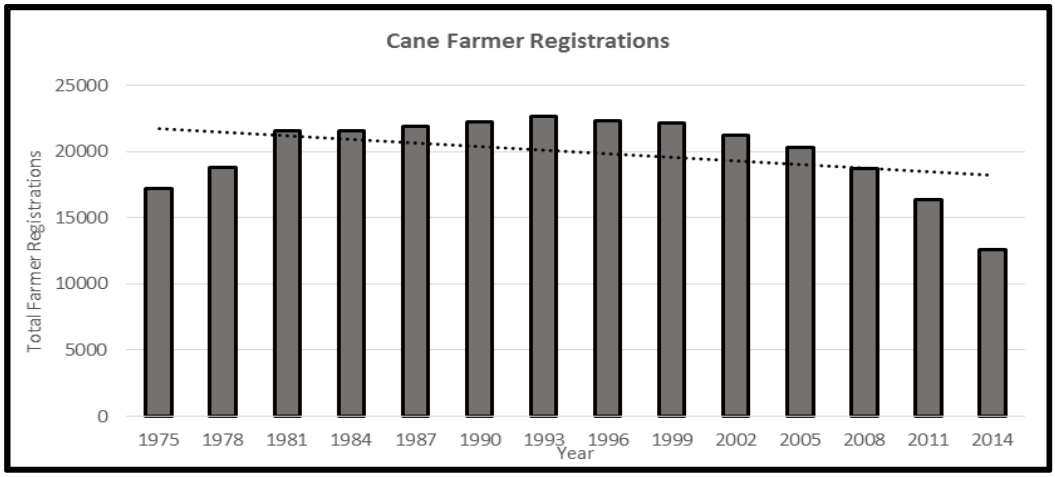

Figure 8.3: Cane farmer registrations Vs Year
Source: SRIF

Currently, about 70 percent of the total cane crop is produced by 30 percent of the cane farmers and 30 percent is produced by 70 percent of the cane farmers. This has the SCGC concerned that 80 percent of cane farmers in Fiji are only 'hobby' farmers who do not take on sugarcane farming as a business. This group are smallholders who have other means of income (SCGC: 2015, Semi-structured Interview). They are either taxi drivers or bus drivers or work in supermarkets, or their sons and daughters are working in professional occupations as teachers, doctors and nurses. Many of these so-called 'hobby' farmers also have children who are living overseas and who frequently send remittances to their families back in Fiji.

Remittances are Fiji's second largest foreign exchange income earner (after tourism) (Prakash: 2009). This means that a farmer who has children working elsewhere or overseas will be less bothered about farm output, knowing that he has a source of income from family remittances, and also other forms of incomes to fall back on.

My own observations supported the view that the majority of farmers do not have a long-term commitment to the industry. Some may be hoping to migrate overseas whilst others may simply have realised that sugarcane is no longer a viable product. Many farmers continue to plant simply because they still have the land available to them, but once their leases expire, they will take up other occupations elsewhere.

8.3.3 Loss of Farmer Confidence

The sugarcane growers in Fiji have begun to realise that their future in the cane industry looks bleak. Therefore, maintaining farmer confidence has become one of the most important issues facing the MoS (MoS: 2015, Semi-structured Interview).

Over the past 20 years, the industry has recorded a drop in income from sugar, causing the majority of young farmers to leave the remote and rural cane belt areas and migrate to the urban centres of Fiji in search of more secure employment, and better education for their children.

> "Children of farmers are happier to work at supermarkets and other places where the salary is consistent and the jobs are guaranteed rather than working doubly as hard in the farms where income is paid out in four instalments over two seasons of crushing from FSC. Also, areas where cane farms are concentrated lack proper infrastructure and essential services like schools, better medical care/hospital services which are all located in the urban areas of Fiji" (MoS and MoA: 2015, Semi-structured Interview).

The Fiji Cane Growers Association General Secretary, Mr Dass, was also quoted as saying that "farmers who have been involved in sugarcane farming for generations were already turning to other forms of agriculture because of a growing lack of confidence in the industry" (Chaudhary: 2015b).

8.3.4 Loss of Productive Land to Urban Development

During the colonial era, most of the cane belts were concentrated close to the mills and the railway lines. The MoS and other stakeholders, in particular the SCGC, SRIF and FSC, advised that over the past two decades, substantial amounts of land have been lost to the expansion of towns and cities and residential areas. SRIF estimates approximately 20-25 thousand hectares of fallow land (productive land that had been reserved for cane farming) that once used to produce a significant amount of sugarcane has been lost.

> "The production of cane that started some 100 years ago continued to move from flat, fertile lands into marginal areas. Currently, the flat areas that we have are about 27 percent only. The rest of the cane comes from areas that are marginal in nature" (SRIF: 2015, Semi-structured Interview).

When the farmers tried to expand their farms, they were left with no option other than to expand onto marginal lands that have shallow soils with lower productive potentials. Most of these marginal lands are in hilly terrain where cane is difficult to plant, it involves intensive labour, and nutrient runoffs and soil erosion are radically high.

The expansion of farms inland away from the mills due to the reservation of lands around the towns and cities for developmental purposes has been unfavourable to the farmers. It has increased the distance from farm to mill considerably. Consequently, transportation and carting have now become a major problem. Increasing cartage costs for the farmers are also due to a failure of FSC to manage the railway system well for transporting the harvest.

8.3.5 Milling Inefficiency

Over the years, the FSC has consistently failed to produce sugar in excess of the preferential quota, as mill breakdowns were frequent whenever mill throughput was increased. Despite the fact that in any given year the corporation has a minimum of 6 months to maintain and repair the mill deficiencies before the start of the next crop harvesting and crushing season, in 2015, concerns were raised by the organizations representing the sugarcane growers that FSC would not be able to

handle increased production, with the National Farmers Union stating that the deteriorated conditions of the mills and rail networks could see crushing seasons for 2015 being extended into 2016 because of the inability of the mills to handle the increased volumes of cane (Chaudhary: 2015a).

Nasokia (2015) reported in the Fiji Sun that the FSC Executive Chairman anticipated less unplanned stoppages at the mills. However, it was later reported by the Fiji Times that there were issues surrounding the Lautoka mill, with the Government aware of the situation. The mill's malfunctioning 12 megawatts generator was replaced by the 5 megawatts machine that reduced the crushing rate per day. If mills become non-functioning in the process of crushing and require maintenance work, cane will be stuck for days and the elapsed time will eventually deteriorate the quality of the harvest.

The Penang mill in Rakiraki also had many issues in 2015, some of which were a molasses tank outlet-valve leaking in the second week of its operation, a leak on the pan and evaporator dump line, and spillage via frothing from the crystallizer and choking off one of the tanks.

Other issues remaining unsolved at the mills are the non-availability of proper sanitation and toilet facilities, ablution blocks (for cane farmers and lorry drivers that follow the Muslim faith) and the prolonged waiting time that lorry drivers have to endure every day during the crushing seasons (Naidu: 2015).

Figure 8.4: Lorry drivers awaiting their turn
Source: Author

Figure 8.5: Lorry drivers taking their lunch
Source: The Fiji Times

Drivers with their Lorries loaded with sugarcane have to join two-kilometer-long queue at the Labasa Mill before they can unload during the crushing season (Labasa

Cane Lorry Driver: 2015, Personal Communication) resulting in the loss of productive work time and increasing health risks (refer Figures 8.4 and 8.5).

The drivers usually have to wait in the queue for as long 15-20 hours with meals that they bring from home expecting that the process will last only a few hours (Sigatoka Cane Lorry Driver: 2015, Personal Communication). There are similar scenarios at the other two mills, Penang and the Rarawai, with the drivers writing numerous letters to the MoS about their plight.

8.3.6 Climatic Factors, Pests and Diseases

Fiji sits in a natural disaster prone zone. Increasing frequencies of hurricanes and storms coupled with flooding have affected the sugar industry for many years. The country has also experienced two years of continuous droughts and four devastating cyclones since 2010. Also, because of climatic disturbances, agricultural crops such as sugarcane are threatened by a wide variety of plant diseases and pests.

8.3.6.1 Drought

Farmers in the western division, and especially the Tavua-Rakiraki region, are usually faced with uphill battles in maintaining their livestock during seasons of dry spells. Livestock are kept for several reasons. These include for use as animal traction, as a food source, for bartering in exchange for goods and services, and for selling for income generation whenever required.

During the dry season, farmers have to fork out money to purchase alternative food supplies such as copra and mill-mix to feed their animals because pasture is scarce or not available. Farmers are compelled to travel long distances by foot or other means to search for water sources every day during such hard times. Adding to the worry of dry weather, some farmers are faced with cattle invading sugarcane farms to feed on the sugarcane plants. This leads to the new plants being uprooted. Also, once the crop has been fed upon, it is difficult to recover the sugarcane. Devi (2015) reported a 50-year-old cane farmer from Karavi, Ba only managing to harvest 27 tonnes of cane in 2014, 10 tonnes less than in 2013, from his 10-acre plot after the cattle had invaded his cane fields. According to the farmer, he has borrowed FJ$2500 from SCGF and if he hoped to pay back his loan, he would need a good

harvest and this was not possible if he kept incurring losses such as those arising from cattle invasion.

8.3.6.2 Cyclones

Cyclones in the Pacific are not a new phenomenon. Many of them have, over the years, caused widespread destruction of property and infrastructure and disrupted economic activity, bringing sorrow to tens of thousands of people. Many have lost their livelihoods, their shelter and their belongings. According to the FSC, loss of cane crops after the devastating Category 4 Cyclone Tomas hit Fiji in 2010 was estimated at 6,000 tonnes worth FJ$3.3 million, primarily for the Northern Division (NDMO: 2010). Some farms remained waterlogged for several days and this resulted in the destruction of the crops that then required replanting. When Tropical Cyclone Evan hit in December 2012, the crushing season for that year had already ended and the new cane was still in its mid-maturing stage. This meant its impact on sugar production was not felt until 2013.

In 2016, Fiji had planned to produce 224,000 tonnes of sugar, but when Tropical Cyclone Winston hit the country in February of that year, FSC estimated that 50 percent of the sugarcane crop production on the main island of Viti Levu was affected (Marques: 2016). The Tavua-Rakiraki regions were the worst affected with its Penang Mill shutting down and FSC declaring it non-operational. A preliminary assessment was of damage worth US$36 million to the cane industry, including an 80 percent loss of the total cane crops (Radio NZ: 2016).

During this time, the farmers in this region were left with only two options: (i) either ask the authorities to revive the mill somehow, or (ii) transport their produce to the nearest Rarawai Mill. This would have added another cost to production. However, the Fijian Government stepped in to cover the entire cost for cane farmers in the Penang Mill area of transporting their cane to the Rarawai Mill in Ba for processing, as the Penang Mill in Rakiraki could not be repaired in time for the 2016 crushing season (Chandar: 2016).

> "In the wake of Cyclone Winston, I saw the widespread devastation wrought on our sugarcane industry. Our cane growers took a heavy hit to their homes, properties and crops… and it is the duty of my Government to alleviate the suffering of these growers by covering the costs of

> transportation for all farmers who previously used the Penang Mill" (Prime Minister of Fiji: 2016).

The Penang Mill has now ceased operations for good and farmers in the Rakiraki area are forced to transport their produce to the Rarawai Mill in Ba, although there are some levels of compensation by the Government and the FSC for transportation and cartage costs.

> …we have to look from a general perspective about investing money into that mill…it is a 100-year-old technology…our cane production has fallen by more than 50 percent from 40 years till now…if we fix Penang mill now, four of the mills will be crushing less than 50 percent of the production…it is like running an engine with very little feed…unless we increase production, we cannot have all four mills running at full capacity…it is waste of energy, waste of fuel…all adding to overhead costs (Mr. Yogesh Karan: Permanent Secretary-MoS, Fiji One News, 13th of January 2017).

8.3.6.3 Climate Change

Cane needs good rain with the right amount of sunshine and moisture in the atmosphere for it to grow. In this sense, the climate of Fiji is ideal for sugarcane growth. But the industry is in danger from changing climatic conditions. At the International Sugar Organizations 48th council meeting in London, the Minister for Sugar in Fiji described climate change as an "immediate risk and not a challenge to be faced sometimes in the future".

The intrusion of water into the cane fields due to rising sea levels is one effect of climate change, in the view of farmers, but this is also because of broken floodgates. Rail lines are also being corroded by the intrusion of seawater onto land and the cost to the industry of rerouting and remounting these would be significant.

In a study carried out by the International Union for Conservation of Nature (IUCN), the January 2009 floods in Fiji were reported as the worst since 1931. They affected areas in Western Viti Levu the greatest, followed by the Northern and the Central division of Fiji. The total economic cost was estimated to be $24 million with an additional humanitarian cost of about $5 million. The cost to cane growers'

farms and households (loss of cane output, non-cane and other farm losses, loss of possessions, house repairs, human health costs and clean-up costs) was estimated to be $13.4 million. The value of washed-away land could not be ascertained. The millers alone lost approximately $7.5 million in capital investment and revenue from cane (Lal et al: 2009).

8.3.6.4 Pests and Disease

According to SRIF, the infestation of pests and diseases is common in the sugarcane fields if they are not managed properly. Common pests in the fields include weeds such as grasses, broadleaf and creepers, sugarcane weevil borer (*Rhabdoscelus obscurus*), rodents, mongoose, feral pigs, unsupervised cattle, ants and termites. The weeds are responsible for up to 25 percent reduction in cane yields. Major grasses, broad leafs and creepers found in the cane yields are listed below with their scientific, common and local names wherever possible (refer Table 8.2).

Type of Weeds	Scientific Names	Common Name	Local Names
Grass	*Rottboellia cochinchinensis*	Itch Grass	Daula
	Pennisetum polystchyon	Mission Grass	Sotia
	Panicum maximum	Guinea Grass	
	Setaria lutescens	Mongoose tail grass	Bandariya
	Eleusine indica	Crowsfoot grass	Ghodraiya
		Nadi Blue Grass	Batiki
	Cynodon dactylon	Couch Grass	
	Digitaria ciliaris	Summer Grass	
	Brachiaria mutica	Para Grass	Para
	Sorghum halepense	Johnson Grass	
	Echinochloa colona	Jungle Rice	Jungli chaur
	Paspalum conjugatum	Sourgrass	
	Brachiaria subquadripara	Green Summer Grass	
Broadleaf	*Ageratum spp*	Billygoat Weed	
	Phyllanthus spp	Phyllanthus	
	Crotalaria striata	Rattlepod	
	Amaranthus spinosus	Needle burr	
	Euphorbia heterophylla	Milkweed	Dudaiya
	Amaranthus viridis	Green amaranth	Chauriya
	Portulaca aleracea	Pigweed	
	Physalis minima	Wild gooseberry	Bootkaiya
	Euphorbia hirta	Asthma Plant	
	Cleome viscosa	Spider flower	
	Cassia tora	Kaumoce	Chakor/Chakori
	Sida acuta	Broomweed	Bariyara
Creepers	*Cyperus rotundus*	Nut grass	Motha
	Mormordica charantia	Balsam pear	Karela
	Centrosema pubescens	Centro	
	Milkania micrantha	Mile-a-minute	Taitaiyabaour/boaour
	Passiflora foetida	Stinking passion flower	Qarandila
	Mimosa invisa	Giant sensitive plant	Ultakata
	Mimosa pudica	Sensitive plant	Lajhonia
	Coccinia grandis	Ivy gourd	Kundru
	Ipomoea quamoclit	Quamoclit	

Table 8.2: Types of weeds, their scientific and local names
Source: SRIF (2015)

Other than weeds, the cane crops are also exposed to diseases such as Fiji Leaf Gall Disease (FLGD) and Ratoon Stunting Diseases (RSD). Occurrences of these diseases are common among the cane plants. Both diseases have been found to have a devastating effect in all the cane belts of Fiji, having severe effects on both ratoon and newly planted crops. FLGD results in the stunting of cane plants, causing raised whitish-yellow swelling (galls) on the back side of the leaf blade and midrib of the leafs, with cane tops showing 'bitten off' symptoms. FLGD infections results in losses of 100 percent of infected cane and is more common in susceptible sugarcane varieties such as the *Mana* variety. RSD results in slowing the germination of the plant, affecting its health and reducing the number of stalks, leaving the crop with short and thinner and stunted leaf growth. With RSD, the nodes of the matured canes usually also suffer from discolouration in their vascular bundles (SRIF: 2015, Semi-structured Interview). Incidence of RSD infection usually affects about 28 percent of the crop, costing Fijian farmers thousands of dollars (Johnson and Tyagi: 2011).

Globally, RSD is one of the most devastating diseases of sugarcane, causing losses up to 30 percent per year (Hughes: 1974). It costs the Australian sugar industry $AUD10 million annually and if no control measures are practiced, losses could reach as high as $AUD200 million (Croft et al: 1993). According to Johnson (2006), a survey and loss assessment has not been done to determine the effects of this disease in Fiji. In his study, Johnson observed that the only notable effect of the disease was on the cane yield, with very little effect on the percent of pure obtainable cane sugar (% p.o.c.s). The cane yield for the first crop and subsequent ratoon crops (third year, fourth year, etc.) differed. Johnson found that the first crop is more susceptible to the disease. For subsequent crops, there is a 37 percent reduction in disease infestation, but the average loss (over the first, second or third years, etc.) was 27 percent. Johnson recommends that to control the disease at manageable levels, an integrated approach including resistant varieties and hot water treatment be used to prevent disease infestation.

Although Smut Disease is not prevalent in the country as yet, SRIF recommends that Fiji needs to prepare itself for this disease. The disease is known to have spread around the globe in the 1970s and 1980s. In the past ten years, the disease has managed to reach Australia. Papua New Guinea and Fiji are the only two producing

nations that are known not to have the disease. The Smut Disease is said to be very serious, causing production losses of between 30-100 percent.

8.4 Part Three: Farmers' Problems

Some problems facing the sugar industry are unique to the cane farmers. These were captured from focus group discussions, livelihood survey, participant observation, farmer interviews and agroecosystem analysis. They are here listed as problems of industry representation; security of land tenure; scarcity of labour; rising cost; and local politics and conflicts.

8.4.1 Industry Representation

Cane growers are the largest stakeholder in the sugar industry, but they have a weak say in its management (Chaudhary: 2015b), and the evidence is that they have long been searching for a larger voice. They feel that decisions are being made in air-conditioned offices without taking account of the real issues on the ground.

The current situation of the farmers is disheartening. Throughout the research, it became apparent that many farmers believe they are in a losing battle. They feel that solutions to problems are being implemented without seeking farmer suggestions and advice as to how best to address them. The situation is somewhat like being 'trapped in a fire, there is no emergency number to call, there is no way out for them, just the upstairs window to look out of while the fire burns the house with them locked in it' (Lautoka Farmer: 2015).

> None of the farmers know what will happen in December 2017…do not know what disaster is going to take place. No one comes and asks farmers what are their needs and what they want. FSC has made its own plans of FJ$1.5 billion although…they don't have money to survive.
>
> It is just like a soccer field. Farmers are the main players, and we have balls in our hands. There is no one asking us as for how we are to play the game with this ball……the linesmen……the referee and the coach they themselves [referring to the key institutional stakeholders of the industry] don't know what is about to happen and how the players are to play the game.

> We feel that why they are not asking us is because we do not have any legal representation in the industry. Someone who can speak on our behalf. There is only an administration part to the Growers Council left and the council has their board missing. The Government should listen to the grower issues, and if they do not want to then they are not obliged (Labasa Farmer: 2015).

The pool of councillors that the Labasa farmer was referring was originally elected to the SCGC board by the farmers to represent their interests. In 2009 however, the Government, thinking the SCGC was becoming too political, dismissed them. The SCGC is currently run by a C.E.O with policies determined by the Government and directed by the MoS. Its operational costs, however, are still paid for by a fund generated through a levy on the farmers.

Similarly, with the Cane Producers Association (CPA). In 2015, the Fiji Times (Chaudhary: 2015c) reported that the interim head of the Rarawai-Penang Cane Producers Association, Mr Girish Kumar, was disappointed with the lack of consultation by the Sugar Ministry on issues that cane growers had with the make-up of the SCGC board. He went on to say that "…if this Government is serious about assisting farmers then it has to meet with us and listen to what we have to say on the issue…".

8.4.2 Security of Land Tenure

In addition to the falling sugar prices and market uncertainties, security of land tenure is another major issue currently being faced by the cane farming community in Fiji. Firstly, the problem with the land leasing system is that the thirty-year leases under ALTA (1976) are only one generation long in nature. Secondly, the option of renewal rests entirely with the landlord. This puts the tenants at the mercy of their landlords whenever they seek renewals. Only a few cane farmers have legal land ownership title in their own names.

Issues of land tenure began to arise when land leases under the ALTA (1976) started to expire in 1997. By 2028, a total of 13,140 land leases is expected to have expired (refer Table 8.3).

Year	Leases expired	Year	Leases expired	Year	Leases expired	Year	Leases expired
1997	134	2005	463	2013	487	2021	168
1998	237	2006	521	2014	380	2022	135
1999	1594	2007	652	2015	784	2023	148
2000	1955	2008	299	2016	361	2024	88
2001	458	2009	278	2017	177	2025	85
2002	622	2010	374	2018	254	2026	65
2003	432	2011	445	2019	306	2027	54
2004	600	2012	419	2020	152	2028	13
Total	**6,032**		**3,451**		**2,901**		**756**
			Grand Total: 13,140				

Table 8.3: Total land lease expiration per year
Source: Naidu and Reddy (2002)

The expiration of sugarcane land leases has been one of the major reasons why people are leaving the rural farming sector and pursuing job opportunities elsewhere, either in the urban areas of Fiji or overseas, and this is causing a loss of human resources (kin as workers) on the farms.

> Some of my own family members who are sons of cane farmers have migrated to Aotearoa/New Zealand to work in the dairy industry. They have migrated for better income and living conditions. In Aotearoa/New Zealand they can earn as much as NZ$55,000 to $75,000 annually, something that they would take them 7-10 years to earn in Fiji. Although in Aotearoa/New Zealand life is a bit difficult, waking up early as 3am for milking, and working seven days throughout the week, it is still better than living in poor conditions on the sugarcane farms and earning peanuts (Reflective Journal Entry: 2015).

Lal et al (2001) point out that the commercial future of the industry is heavily dependent on the resolution of the land tenure system that has been in place since 1909 when the colonial British Government froze land-ownership titles in an attempt to protect indigenous property owners.

8.4.3 Scarcity of Labour

Another major point of concern for farmers is the lack of, and in some cases the non-availability of labour to assist with the harvesting of sugarcane during the harvesting and crushing seasons. The movement of people away from the farms has resulted in the loss of labour for harvesting and transportation, most of which the

farmer and his family would traditionally do themselves (FSC: 2016). However, the majority of the current pool of farmers' children do not want to work on the farms as they would have done twenty to thirty years ago. Others see those who are engaged in agricultural work as third class citizens. The other problem is the age factor. Once the old farmer, who is regarded as the head of the household, passes away, their children are not interested in carrying on with cane farming. The wife then sells the farm, or the farm just fades away over time.

The current situation is one where farmers are continuously faced with difficulties in getting labourers to assist on the farm. The farmers are dependent on hiring labourers from outside of their normal gang or nearby villages, or sourcing people from outer islands who are mostly of *iTaukei* descent. Some farmers feel that, in general, these labourers do not feel any responsibility for the cane industry. Others complained that these labourers were not trained, and are not used to doing things on time.

Over the past five years, cane cutters' demands have risen considerably in terms of the remuneration and other benefits. For instance, in order to maintain a labourer, farmers have to provide him/her with accommodation, three meals per day, pay for transportation to bring him to the farm and send him back home whenever necessary, and provide tea/juice whilst they work in the field, all in addition to their normal wages.

Many farmers have to make a lump sum payment five to seven months ahead of the harvesting season to bind labourers to themselves so that other farmers cannot pull and utilise them in their farms. If for example, the labourers demand an upfront payment of FJ$500 per person, and if the farmer requires three labours to help with the harvesting, then that is FJ$1500 straight away, even though it can later be deducted from their wages. The farmer is then burdened with the challenge of receiving the payments from FSC for his produce in a timely and consistent manner, so he can compensate the labourers for their work on time.

Farms where mechanical harvesters cannot be operated, or those farmers or gangs who cannot afford to mechanically harvest their produce, have the options of securing harvesting contractors to harvest the canes for them, use prison inmates - a new solution, or employ labourers from elsewhere called 'sign man' (contracted

labourer). There are many risks, however, in engaging contractors, inmates or 'sign man'. For example, when I was carrying out my field work in the Tavua-Rakiraki region, news spread that a 15-year-old Penang Sangam High School student, the daughter of a farmer, was hacked to death by one of the 'sign man' using a cane knife, and while trying to save his daughter, the farmer also suffered serious injuries to his head and face. Eyewitnesses and school students were left traumatized. One of the eyewitnesses informed that *"the 'sign man' came out with a knife and struck the two…I was shocked at what I saw…we just helped the father and daughter get to the hospital"* (Fiji One News: 2015).

To aggravate the situation, a witchcraft doctor was later found stealing the human remains of the deceased after her cremation. The police managed to apprehend the offender after a tip-off, but the series of incidents shook the entire cane farming community in this region.

> Aaj kal to kuch pata nahi hai…sab to apan apan naatak dekhaye hai…kiske sako yaha pe trust karo…koi to paisa leke bhaag jawe hai to koi koi ke maar dewe hai jaan se… [These days we cannot trust anyone…everyone has their own dramas…some of these labourers run away with our money and some even kill us] (Rakiraki Farmer: 2015).

8.4.4 Rising Costs

The costs for producing cane remain high, despite numerous measures being put in place to curb costs. Harvesting and transportation is the major cost issue for the farmers and the industry as a whole. 50 percent of the total cost of producing cane is attributable to harvesting and transportation alone. Furthermore, due to financial constraints, FSC has not been able to manage the rail system well. The locomotives, rail trucks and tramlines are almost 100 years old now (FSC: 2015, Semi-structured Interview), just like their milling technologies (Mr Yogesh Karan: Permanent Secretary- MoS, Fiji One News, 13th of January 2017). Furthermore, the rail system is accessible only to those farms within a 20 km radius of the sugar mills. This puts those farms located beyond a 20km radius of the mills at a disadvantage because of the additional costs of road transport.

During the CSR days, 70-75 percent of sugarcane harvests was delivered to the mills through the rail system, and around 20-25 percent was delivered by trucks and

other means. The trend has now reversed, with 70-75 percent of total produce being carted by trucks[28] and tractors, and only 20-25 percent delivered through the rail systems (SCGC: 2015, Semi-structured Interview).

Because of the deteriorating conditions of the rail system and the non-existence of train lines beyond the 20km radius of sugar mills, farmers have been compelled to use trucks and tractors, thereby incurring additional costs. This is proving to be a heavy burden on them (SCGC: 2015, Semi-structured Interview). The situation is made worse when repairs to cane access roads start late. A late start to repairs affects the industry for many years with disruptions to the harvesting and transportation of produce to the mills.

The high volume of trucks has an impact on the road systems during peak seasons of harvesting and crushing when the roads become heavily congested. Cartage of sugarcane harvests therefore tends to become extremely costly at this time, but there are grant schemes to help cover some of these costs. Truck drivers also often face greater difficulties at these times, and there is a higher rate of road accidents. This leads to wastage of cane and the deterioration of cane quality while it is reloaded and carted to the mills (refer Figures 8.6, 8.7 and 8.8).

[28] The Master Award clause 11.1 caters for all growers registered in the Register of Growers delivering cane to a mill by road, (other than those whose farms are within 20 kilometres of a mill) who shall be entitled to a transport allowance payable at the rates set out in the schedule to this part of the award, to compensate them in part, for the additional costs borne by them in delivering cane to a mill as compared to growers who transport cane to a designated point on the tramway, and who bear no cost of transport from that point to a mill. The schedule is described below:

Zone 1	*More than 20km but no more than 35km from a mill*	*FJ$1.10 per tonne*
Zone 2	*More than 35km but no more than 50km from a mill*	*FJ$2.10 per tonne*
Zone 3	*More than 50km from a mill*	*FJ$3.30 per tonne*

Figure 8.6: Cane being dumped along the road side due to carting truck failures
Source: Author

Figure 8.7: Tractor carting the canes face mechanical failure and crashes into a private property
Source: LCPA

Figure 8.8: Labourers picking up the canes after a cart failure
Source: LCPA

Other major costs are cane seed, weedicide, pesticide and fertilisers. In recent years, the cost of inputs such as herbicides, pesticides and fertilisers have skyrocketed, and this is impacting on the income and livelihood of farmers. A brief calculation of the total cost of production per tonne of cane, given to me by the son of a Ba farmer during my fieldwork, presents a picture of the reality faced by this cane farming family and community, and provides some perspective on the economic viability of farming in Ba in 2014.

CANE FARMERS OF FIJI: STRONG BUT BLIND AND DEAF IN THEIR ABILITIES!

Why do I say the above? Let me show you an analysis and inside look in the BUSINESS of cane farming- something that the Fijians of Indian descent and eventually fellow native *iTaukei* communities have been engaged in for many years to bring the country's economy, the generation of youths, and their sons and daughters to where they are today.

BUT WHAT WOULD BE THE FUTURE OF CANE FARMING IN FIJI? The future seems bleak for the industry if the ageing fathers are the last generation

of cane farmers who have persevered so hard and brought up their kids in pursuit of formal education to get white and blue collar jobs.

AND HOW REALISTICALLY WORTHWHILE IS CANE FARMING IN FIJI IN THIS DAY AND AGE? The real figures below may and shock and surprise you and will surely make you understand how cane farming works in Fiji. I speak as a cane farmer's son myself. As a case study, a gang of farmers in the [redacted] Sector, Ba has 18 Cane farms that they look after and harvest with 29 cane cutters. This is how the process works:

> *A Cane cutting gang looks after a set of farms. The owners of this farms (Farmers) either farm and also cut cane in the gang, or just farm and let the cane cutters cut it. Each cane cutter gets fortnightly wages based on the tonnes of cane he (or SHE) cuts. So in a nutshell, it is the FARMERS and the SET of Farms of a Gang that actually PAY EVERY MEMBER OF THE GANG for the duration of cane harvesting in Fiji.*

WHO GETS PAID HOW MUCH? When FSC buys the cane from farmers, they pay them per tonne of cane supplied. How much? Just before cane harvesting, FSC forecasts a price per tonne which is the minimum assurance a farmer will be paid for the cane supplied. This year the forecast was FJ$62.50. And without going into the in-depth technicality of payments, this is how basically payments work, both to farmers and cane cutters:

> *Cane cutters get paid $18/tonne cane cut. On an average, a Cane cutter in the Gang I am talking about gets paid around $240/fortnight and this year there were 11 wages. Meaning in the nearly 5 months of cane-cutting, a cane cutter got paid $2640 ONLY!! (Means if it was an annual salary on this rate, he would get paid just $5760!!) And this is what he has to survive on looking after his family!!!*

And this is how FARMERS GET PAID: The below summarises the payments[29] for the produce.

> *In the said Gang, the highest tonne of cane harvested by one of the 18 farmers was 397 tonnes and the lowest was just 40. One must understand that each farmer has varying acres of land with them to plant cane. The largest farm in the gang has a total land of 14 acres and the lowest being 4 acres. This year the total cane harvested from all the 18 farms collectively was 4000 tonnes, so the average cane tonne per farm is about 222.*

My dad owns a separate plot of about 10 acres on which he planted sugarcane on about 7 acres and total cane harvested this year was 140 tonnes. And this is how he will get paid:

> *FSC pays out FJ$65.20/tonne. Therefore, total income would be (140 x FJ$65.20) = FJ**$9128** FROM WHICH DEDUCTIONS of $22 per tonne would be made for payments to the gang for cane cutter and related expenses resulting in an amount equivalent to $3080. Similarly, other deductions by FSC include expenses for fertilisers (20 Bags x FJ$31.50each) resulting in FJ$630. 4 Bags of sugar bought by the farmers at a rate FJ$74.35/bag = FJ$297.40, 4 Bags of rice given at FJ$57/bag = FJ$228. So a total of FJ**$4235.40** is DEDUCTED FROM GROSS INCOME resulting in a revenue of FJ**$4892.60**. From this, you can further deduct miscellaneous payments such as fuel for the tractor to plough the land, the hiring of labourers to plant sugarcane and work in farms, expenses on pesticides and weedicides of about*

[29] The price paid to farmers in 2013 was FJ$88.49 including a special payment of FJ$5 per tonne (FSC: 2015). A reduction to FJ$80.98 per tonne in 2014 meant a loss of $13.1 million to farmers in direct income. The outcome of this would have been massive with adverse impacts on the livelihood of the farmers and in their capabilities to increase cane production because such a reduction would be extremely demoralizing. A stagnant FJ$85 per tonne for the next five to seven years could lead to instilling confidence in farmers to increase their productions. FSC reports showed that delivery payment, second payment, third payment, fourth payment and final payment was FJ$37.62 per tonne, FJ$12.52 per tonne, FJ$15.13 per tonne, FJ$15.00 per tonne and FJ$0.718 per tonne respectively for 2014.

> *FJ$892.60**.** This means that my dad as a Farmer earned just FJ**$4000** from this farm in a year (6 months of planting and 6 months harvesting).*
>
> *FJ$2640 for a Cane cutter and FJ$4000 to a Farmer for a whole year to survive on with his (or her, yes there are female cane cutters) families. Safe to say this may be more or less the figures for Cane cutters and farmers across our nation?*

I salute my dad and all the farmers out there for bringing our generation to who we are today, but what will become of the sugar industry upon their retirement? Even today cane farmers persevere daily on their lands. They are blind and deaf to anything else, especially everything I have said above and knows only the strength required to do the physical labour in their farms, something they have been taught to do with history. But they were smart enough to not want their kids to do the same.

> "My sister, a daughter of a cane farmer earns in the range of FJ$19-25,000 annually. My last 2 employment paid me $17,500 on probation and I have worked at 12 different places on varying salaries. And while our generation looks into better opportunities academically with formal education, the above tells the story of the perseverance of our hardworking parents and ancestors".

8.4.5 Local Politics and Conflict

Sugarcane farming in Fiji is constantly being transformed and re-shaped by changing relationships within the communities. Any discussion of internal politics in cane farming must therefore consider differences in settlement types, worldviews, trade relations and socio-economic factors. Despite the appearance of healthy relationships within rural farming communities in Fiji there does exist conflicts and status rivalries. The following subsections discuss some of these problems and their sources.

8.4.5.1 Farmer Inequalities

Firstly, the FSC, being in the position of monopolistic miller is in a position to create rivalries among the smallholder sugarcane growers, and encourages some farmers to expand their production beyond their 'farm basic allotment'[30] (cf. Chand: 2005). Secondly, as there is no threshold to production levels no penalties apply when farmers produce in excess of their 'farm basic allotments', or are unable to meet the required production levels. Thirdly, the reality is that farms are not all similar in nature; one farm varies from another temporally[31] and spatially, and favourable natural settings impact on farm output. As do informal political relationships.

Given the above scenario, the system also allows the 'lucky' farmer to earn super-normal profits whilst the more marginalised ones are further marginalised. This situation is worsened by the politics that take place at the gang level: as (i) when prominent farmers are favoured over the others in the same gang, or (ii) when prominent sectors are favoured over the others in a milling area.

> The pool of participants who took part in the semi-structured interviews as representative of the various institutional stakeholders were all prominent people in the industry, and I noticed that those of them who also owned cane farms, already had their canes harvested and processed, while some poorer farmers were still waiting for their quotas from the Field Officers. It appeared that favouritism still exists in the industry (Diary Entry: 2015).

The disparities in level of output between one farm and another may also be affected by unforeseen circumstances and the prevalence of favourable or unfavourable weather conditions in the different parts of the country. This is one reason why, in the course of fieldwork, some farmers were seen as having no problems whilst others had many problems.

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[30] Farm Basic Allotment means the tonnage of cane allotted to a farm by the Sugar Industry Tribunal (SIT) being its share of the national basic allotment of cane.

[31] Structure and fertility of soil; physical, chemical and hydraulic soil properties; irrigation applications; pest and diseases; plant genetics.

8.4.5.2 Cases of Fire in the Cane Fields

One of the most common signs of rivalry within the cane farming community is cane field fires. There have been a rising number of cases of fire destroying the cane fields being reported by farmers every season. The causes of these fires may be intentional (refer Figure 8.9), or natural (refer Figure 8.10) due to weather conditions. Long months of drought and dry spells with raised temperatures provide favourable conditions for fires. On many occasions, natural occurring fires have burnt the houses of farmers. It cannot be predicted when they will take place. Intentional fires are the result of actions by the farmer himself or another person authorised by the owner[32] of the cane farm.

The main reason for farmers setting fire to their own cane is to harvest the cane ahead of the other farmers during the milling season, in order to avoid the waiting time before his quota is announced for harvesting by the Field Officer of FSC. Intentional burning of cane can also be elicited by the cane cutters who provoke the farmer into burning his cane as they then find it easy to cut. Burning shortens the time required for harvesting. Other reasons for the farmer setting fire to his fields include the farmer not having carried out *patimaar* (the process of cleaning leaves off the cane stalks) in time.

Figure 8.9: Burning of cane field in the evening
Source: Author

[32] This could be the brother, father or grandfather of the farmer, or someone else.

Figure 8.10: Natural cane fire
Source: Author

Cases of arson are also very common in the cane fields. These are due mainly to political and social tensions among farmers or among the extended families of the farmers. In this case, the deliberate setting of fires in the cane fields may be the result of fights, jealousy or hatreds.

> Deliberate cases of arson often involve a traditional igniter commonly known in the sugar industry as a 'bomb'. This involves a mosquito coil and two to five matchsticks. The mosquito coil is lit in the centre and the match sticks are then placed at the end of the coil, or vice versa. This is then placed near dry leaves on the farm away from the sight of people. If the course is successful, after about three hours, the coil would light the matchsticks ['bomb the matchsticks'] which will then light up the dried leaves and the fire will spread burning the entire farm. Usually, such acts are carried out on windy days and the coil is placed against the direction of the flow of the winds, firstly as it will allow the fire to spread quickly, and secondly, it will prove difficult for people to put the fire out. Many farmers have lost their lives while trying to save their farms and in the process, many animals, especially the cattle have also been scorched. It is difficult to catch the culprit because of the delay in time before the fire actually takes place. As one farmer put it, the culprit may place the 'bomb' and catch a flight to Aotearoa/New Zealand, and he may be settled in

> Aotearoa/New Zealand even after the three-hour flight before the 'bomb' actually explodes in Fiji (Field Notes: 2015).

We also have to account for acts of recklessly, or just fun. Farms are at a risk of catching fire from lit cigarette butts being thrown by travelling motorists as highways and feeder roads in Fiji run in close proximity to the cane fields. Fire have also resulted during drinking parties taking place in the cane fields.

In the Tavua-Rakiraki region, I was told that because the region lacks night clubs and bars, most of the cane fields in this region of the country have been used for night entertainments by the locals. People have been noted to become careless and inattentive with their actions, for example, the lighting of a fire in the cane fields while in a state of intoxication (Focus Group Discussion: 2015, Tavua-Rakiraki Region).

It is not so much a problem if the fire takes place during the harvesting and milling season, as farmers may then find a way to harvest their sugarcane and transport it to the mills. Usually, there is a designated time when the mills are open for crushing. These dates are decided by FSC and the SCGC once it has been realised that the canes have started to mature, and are advertised nationally by the SIT. It is unfortunate, however, for those farmers whose sugarcanes are burnt down before the mills have started to operate.

The consequences of fire in the cane field can be extreme and labour-intensive for the farmers. Firstly, the farmer will have to work around the clock to harvest and transport the burnt cane to the mill within seven days, as dictated by the Master Award (Sugar Industry Tribunal: 1989) clause 15.5:

> In the event of his cane being burnt in contravention of Regulation 15.3[33] hereof or prior to the date announced by the Tribunal under 15.2[34] hereof, the grower shall be solely responsible for securing the means of harvesting his burnt cane and delivering the same to the Corporation which shall nevertheless advance harvesting expenses to the grower. The grower, or with his authority, his *Sirdar*, shall be responsible for notifying the Corporation Sector Officer of the date and time when the burning took place and the extent of the cane so burnt (p49).

and clause 15.7:

> Notwithstanding the provisions of Regulation 15.8[35] all cane delivered to the Corporation more than seven days after burning may be rejected (p49).

The situation becomes problematic if the farmer is not able to source labourers to assist him with cane cutting at this time, and if he is not able to meet the seven days' deadline of carting the burnt cane to the mills as set out by the Master Award. One drawback of the Award is that it fails to recognize important days and activities of the national annual calendar such as public and declared holidays, and festive seasons during the crushing and milling periods. For example, if the fire happens to take place on Friday, the farmers will have to wait until the next Monday, as the mills do not operate on Saturdays and Sundays. This means that farmers lose two days in between even if they manage to harvest the burnt cane on the Friday. These two days will then affect the quality of the burnt cane.

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[33] If, after the date announced by the SIT in accordance with Regulation a grower decides after consultation with his gang *sirdar* and the committee of the gang that a specific portion of his cane due to be harvested on programme cannot be harvested green, the grower, or with his authority, the *sirdar* will notify the Corporation Sector Officer in writing of the area to be burnt a day prior to the harvesting. The grower will ensure that the tonnage of cane burnt is confined to the quantity of cane to be harvested and delivered on programme according to his quota allocation as agreed by him with the gang *sirdar* for the 24-hour period following the day of such notification in writing.

[34] After consulting the Commission early in November the SIT shall announce annually when on program burning of cane in compliance with Regulation 15.3 will be permitted in the various Mill areas.

[35] Without prejudice to Regulation 6.2 and for the purpose of ascertaining the basic price payable for burnt cane, in calculating the hours from burning to delivery and acceptance, the day the cane was burnt shall be ignored irrespective of the time that day the burning occurred and time shall run from the commencement of the following day.

While the burnt cane is not of the required quality, it is essential for the operations of mills as it contributes towards the daily supply needed for the effective operation of the mills. There needs to be enough cane present for each day's operations, whether green or burnt. For the mills to operate and start on Monday after being closed on weekends, there needs to be enough supply of cane in reserve to start processing for 24 hours and then roll and link with the next day's operation. The supply of cane has to be continuous, otherwise the operations of the factory and also the broiler is affected since it needs bagasse[36] to run, and it takes a minimum of 4 hours to shut down the entire cane processing activity (FSC: 2015, Semi-structured Interview). For example, the Rarawai mill in Ba requires 4,000 tonnes of cane to operate sustainably daily.

Being able to supply burnt cane to the mills is advantageous to the growers, but they are disadvantaged by other issues. There are, for instance, no policies or institutional arrangements for cane farms to be insured against natural fires, or any other kind of disaster, such as loses arising from droughts, cyclones, hurricanes, flooding, etc. (refer Figure 8.11).

Figure 8.11: A cane farm burnt before harvesting season begins
Source: Author

[36] Bagasse is a biomass by-product of sugarcane processing.

8.4.5.3 Favouritism and Power

Farmers also face cases of favouritism by the Field Officers who tend to favour the prominent and well-established farmers, as they are able to bribe the officers with both cash and kind. If you are a small farmer in a gang, you will have lesser say and be a lower priority compared to the others. Further to this, smaller farmers are at times unable to secure labourers and become dependent on the bigger farmers in their gang, or other sectors who may assist these unfortunate farmers once their own cane has been harvested. The weaker farmers also face discrimination from FSC personals. For example, if FSC staff have stated that they will deliver fertiliser or implements to a farmer on a certain date and it does not arrive, they can only take action after three or four days. For some other farmers there is no delay and everything seems to run smoothly.

> "……Hamaar tum paisa kaat liya e u chiz me hum tumme kuch nahi bolta; phir bhi tum logon rowaye rowaye ke kaam karta……aur elogon mange kisaan A grade ganna paida karo……jab ke tumhar masala mei faulty hai……masala mei kitna sirsa hai, masala mei kitna nimak hai aur masala mei kitna chini away……yellow aur laal chiz haiye nahi hai……admi kis me mehnat kare……ganna mei……bakham mei……konchi admi kare……Even the fertiliser they give to farmers are at times not efficient and has quality issues……Collumber ke peth bhara hai tumme tumma quota milte rahi……sab mila jula Sarkar hai……Collumber batai phuk do adha ganna……mausam barbaad hoy wala hai……thora bara baje khana wana banao……tumhar quota hai hamaar lage khali ghanti giraye dena……Sardaar to asli chor hai……collumber baad mei away sardaar pahile away……"
>
> [……FSC has deducted our revenue from the sales of cane here and there, I did not say anything; yet you (FSC) guys take ages to do something for us……and FSC wants us farmers to produce A Grade quality cane……when everyone knows that you have faulty fertilizer - no one knows how much humus there is in the fertilizer, how much urea there is……what do you want us to work on?.....in cultivation, propping, top dressing…….the fertilizer given to us is not enough……if the *collumber* has had his share of the bribe, the farmer will continue to receive timely

quota to harvest his cane, the *collumber* tells you put the field on fire, the weather is about to get bad, prepare lunch and leave the quota on me……just give me a call……the *sirdar* is even a bigger thief……*collumber* comes later……*sirdar* comes before him……] (Sigatoka Farmer: 2015)[37].

8.5 Some Comparative Studies

Some problems of production discussed above are similar to those experienced by other sugar producing nations. A study of Pakistan by Nazir et al (2013) revealed (a) high cost of inputs for sugarcane cultivation (i.e., urea, diammonium phosphate, farm yard manure, seed and its application), (b) lack of labour and machinery for land preparation, (c) lack of scientific knowledge, and (d) cost of irrigation and weeding as important factors determining a decline in returns for the sugarcane growers.

For Mauritius, Kee Kwong (2005) states that the cost of cane sugar production is among the highest in the world due to a low milling capacity (3700 tonnes cane crushed per day by the 11 existing mills), a short milling season (an average of only 132 days per year), a high ratio of labour cost to total production costs, with field labour making up 80 percent of the total labour costs. The rockiness of the country in some 40,000 hectares of sugarcane lands hindering the adoption of mechanization is also a constraint on sugar production. In addition, though Mauritius is a well-watered island, with an average annual rainfall of 2500mm per year, the uneven distribution of that rainfall coupled with high rates of evaporation (1870mm annually in the northern and western coastal areas) give rise to a moisture deficit of moderate to severe degree, making sustained production not possible without irrigation in the coastal regions.

Similar issues have led to a crisis in Hawaii's sugarcane agriculture. Factors such as lack of mechanization in the mills, severe losses due to infestation of rats (Lindsey et al: 1993) and feral pigs (*Sus scrofa*) (Tobin: 1994), increasing costs and

[37] The farmer is complaining that the FSC deducts payments from the farmers in time, yet they are not able to keep up with their part of the bargain. For example, the fertilizers given/delivered to farmers by the FSC is not on time, etc. Then the farmer complains about the *collumber* (FSC Field Officer) and *sirdar* (Gang Leader), saying that they are corrupt people taking bribes, etc.

competition for resources, and major changes in the international sugar markets produced a string of losses for the sugar companies, accelerating the decline of sugarcane production in Hawaii in the 1980s and 1990 (IUF Sugar: 2017). The IUF Sugar (2017) reported rising labour costs as have caused Hawaii's sugar mills to shut down, shrinking the industry to only one mill which started closing down its operations in 2016 (Solomon: 2016).

In Fiji, two recent pieces of academic research on the problems of the Fijian sugar industry stands out. Singh (2018) focuses on the design of a productivity/ profitability measurement framework for Fiji's sugarcane farming, using the framework to determine the dominant controllable factors, particularly finance, non-financial and social demographic factors, that affect cane production. The research provides feedback to all the sugar industry stakeholders for developing strategies to increase cane production in the future.

Child (2016) investigates the impact of FT certification on producer livelihoods and changes to their experience as growers. She also explores ways that FT, as a development tool, can assist in reducing Fijian sugar industry inefficiencies, improve farmers' power as industry stakeholders, and revitalize the struggling industry. Her research questioned the extent to which FT may mitigate some of the negative effects of the free trade changes with the EU.

While both pieces of research are significant, certain gaps can be identified. Child's research focused on only two CPAs, the Labasa and Lautoka CPAs, and therefore its findings are not representative of all the cane belts of Fiji. Singh's research is focused mainly on problems identified from the discipline of Management.

The current study differs from those of Singh and Child by providing an analysis of all the major problems facing the sugar industry in Fiji, as identified by representative of all the major stakeholders, and in particular by focusing on the situation of smallholder sugarcane growers.

8.6 Chapter Summary

This chapter discussed the problems facing the sugar industry of Fiji, as reported by representatives of its various stakeholders: The Ministry of Sugar (MoS), the Ministry of Agriculture (MoA), numerous other Government and grower institutions, and the smallholder sugarcane growers themselves. These problems are seriously threatening the industry, and have given rise to a lack of confidence among farmers in its future. Since 2012, the Fijian Government has taken several measures to salvage the industry, and in the next chapter, the various solutions that have been proposed will be discussed, and critically assessed from a farmer perspective.

Chapter 9 Solutions and their Limitations

9.1 Introduction

Due to the adverse conditions and events described in the previous chapter, the Fijian Government has since 2012 taken several measures to re-establish the sugar industry as a viable industry for all of its stakeholders. This has led to the formation of a Stakeholder Action Group (SAG) whose task was to provide a platform for enhanced collaboration and a stronger connection between strategy, decision-making and action (MoS: 2015, Semi-structured Interview). After many consultations, the SAG concluded that the industry needed a multi-purpose intervention, regardless of what new market opportunities may exist from 2015 onward. As part of their approach, the SAG prepared a Sugar Cane Industry Action Plan (SAP) that it was hoped would allow the industry to reform, and improve its performance. Details of this Action Plan and farmers' responses to it are discussed below.

The first section introduces the Sugar Cane Industry Action Plan (SAP) and its proposals for intensifying production by increasing the total area under production and increasing yield per hectare, and for increasing milling efficiency. This is followed by a discussion of proposals for diversification and mechanization. In each instance, farmer perceptions of the proposed ideas are given. A chapter summary forms the final section. This chapter answers the research question; what solutions have been proposed for overcoming the current crisis.

The information for this chapter was obtained from semi-structured interviews conducted with participants from the MoS, MoA and other institutional industry stakeholders, and from focus group discussions involving participants from FSC, SRIF, FT and farmers. Additional information from livelihood surveys, literature surveys, participant observation, informal interviews and agroecosystem analyses with the smallholder farmers is also presented.

9.2 The Sugar Cane Industry Action Plan (SAP)

According to the Sugar Industry Stakeholder Action Group:

> The SAP represents a framework for progress across six separate action areas (Crop Production; Cane Quality; Harvesting and Transport; Revenue Generation; Milling and Processing; Industry Re-structuring and Legislation) that extend from grower's field to raw sugar ready for export. It sets priorities, apportions responsibility and is presented in a manner that is accessible, can be used as an 'action agenda' and is easily updateable. It is cognizant of both internal and external industry drivers and is time bound. It does not attempt to provide a detailed economic impact assessment, cost/benefit analyses or feasibility studies for all actions identified. The objective has been to strengthen the level of integration and alignment across the entire value chain by setting out industry agreed on priorities and actions.
>
> Commercialisation of the sugar industry in Fiji is now a priority, Government-ownership must not be allowed to distract industry stakeholders from the immediate pressure to respond to market forces and compete as a sugar producing country. There is a narrow window of opportunity for the industry to focus on competitiveness and to take advantage of this opportunity; the industry stakeholders must be pragmatic, action-oriented and relentless in improving its efficiencies (The Sugar Industry Stakeholder Action Group: 2012, 8).

In 2012, the SAP (The Sugar Industry Stakeholder Action Group: 2012, 31) under section 7 'Core Strategy and Actions to Achieve Targets' identified the following as urgently needed to help improve industry performance:

1. Modest increase in production - the industry was of the view that increasing the total area under production by 9,000 hectares would provide for an additional 510,000 tonnes of sugarcane if it strictly followed the actions set out below:
    (a) 3000 hectares of new land to be identified and brought back into production with a target yield of 50 tonne cane/hectare between October 2012 and June 2013;

(b) An additional 3000 hectares of the cane should be cultivated to contribute to 2014 crushing season with an average yield of 60 tonnes cane/hectare for April/May 2013;

(c) An additional 3000 hectares of plant cane (new cane seeds) should be cultivated to contribute to 2015 crushing season with an average yield of 60 tonnes cane/hectare for April/May 2014.

2. Increasing yield/hectare on existing crops:

   (a) From the existing production area of 41,000 hectares, the balance of 500,000 extra tonnes should be produced by 2015. This will represent a 12 tonne sugarcane/hectare increase over the three-year period.

3. Increasing milling efficiency:

   (a) The milling efficiency had to be increased from an average of 10 TCTS to 9.5 TCTS to extract 289,474 tonnes of sugar from 2,750,000 tonnes of sugarcane in 2015.

9.3 Intensification of Production

9.3.1 Increasing the Total Area Under Production by 9,000 Hectares

A number of problems can be identified with this strategy of trying to increase production by extending the area under production. In the first place, there is reason to doubt that increasing the land area under production will necessarily increase sugar production. A correlation analysis[38] of farmer numbers and production of sugarcane for the years 1975 to 2011 shows that it is only by increasing farmer numbers that production of sugar can be increased (refer Table 9.1).

[38] The IBM® Statistical Package for Social Sciences 22 (SPSS) was used to correlate Year, Farmer Numbers, Production of Sugarcane, and Production of Sugar for the years 1975-2011, using a 2-tailed Pearson Correlation test.

Correlations of Variable: Year, Farmer Numbers, Production Of Sugarcane and Production of Sugar

Variables		Year	Farmer Numbers	Production of Sugarcane	Production of Sugar
Year	Pearson Correlation	1	.002	-.279	-.291
	Sig. (2-tailed)		.992	.095	.081
	N	37	37	37	37
Farmers	Pearson Correlation	.002	1	.653**	.257
	Sig. (2-tailed)	.992		.000	.125
	N	37	37	37	37
Production	Pearson Correlation	-.279	.653**	1	.246
	Sig. (2-tailed)	.095	.000		.141
	N	37	37	37	37
Sugar	Pearson Correlation	-.291	.257	.246	1
	Sig. (2-tailed)	.081	.125	.141	
	N	37	37	37	37
** Correlation is significant at the 0.01 level (2-tailed).					

Table 9.1: Correlation of Variables: Year, Time, Production of Sugarcane, and Production of sugar

The correlation analysis indicates that the Significant 2-tailed level is 0.01, demonstrating that there is a positive relationship between farmer numbers and production of sugarcane of 65.3 percent. This means that as one variable (either Farmer Numbers or Production of Sugarcane) goes up or down so will the other; and that changes in farmer numbers directly affect the volume of production of sugar. This suggests that an increase in sugarcane production could be achieved simply by increasing the number of growers using their existing farming practices, without any need to increase the area of land under production.

However, the above analysis utilized only four variables: (i) farmers, (ii) years, (iii) production of cane, and (iv) sugar produced annually. Data on the total area of land under sugarcane production was not available. Therefore, from a theoretical point of view, it could be argued that for the number of growers to be increased, the area

under production would also need to be increased. However, as is mentioned in Chapters Five (refer Section 5.5) and Eight (refer Section 8.4.2), the number of land leases has been declining as leases expire, and field observations show that on the remaining farms many portions of land are underutilized. This means that expansion of the area of land under production by opening up new areas may not be necessary. It would be sufficient to secure the renewal of existing leases and provide existing farms with better facilities and amenities in order to boost production.

The SPSS 22 Time Series Modeller was used to test this suggestion by forecasting[39] the production of sugar to the year 2025 (51) using data obtained from SRIF for the years 1975 (1) - 2011 (37) (refer Figure 9.1). The results indicate a sharp decrease until 2011 but a slight increase in the production of sugar from 2012 (38) until 2016 (42), and from 2017 (43) onward it shows that production will be consistent until 2025 (51). These results indicate that increases in production can be expected without an increase in the total area of land under production.

[39] The limitations of the above forecast are that it is based on data from 1975-2011, and does not take into account any events since 2011, such as negative environmental events, subsidies/ incentives to produce more sugarcane, etc. which may have resulted in increased sugar production. Therefore, any single event could have the capacity to change the forecast trend after 2015 (41). On the other hand, taking into consideration the solutions being implemented and the negative shocks that the industry has been absorbing since 2011, it can be argued that the previous data does accurately portray the forecast until 2015, and any further negative events after 2015 may not necessarily impact the trend significantly. This is because the years 2011 to 2015 have faced many negative events, as discussed in Chapters Five, Six, and Eight of this thesis.

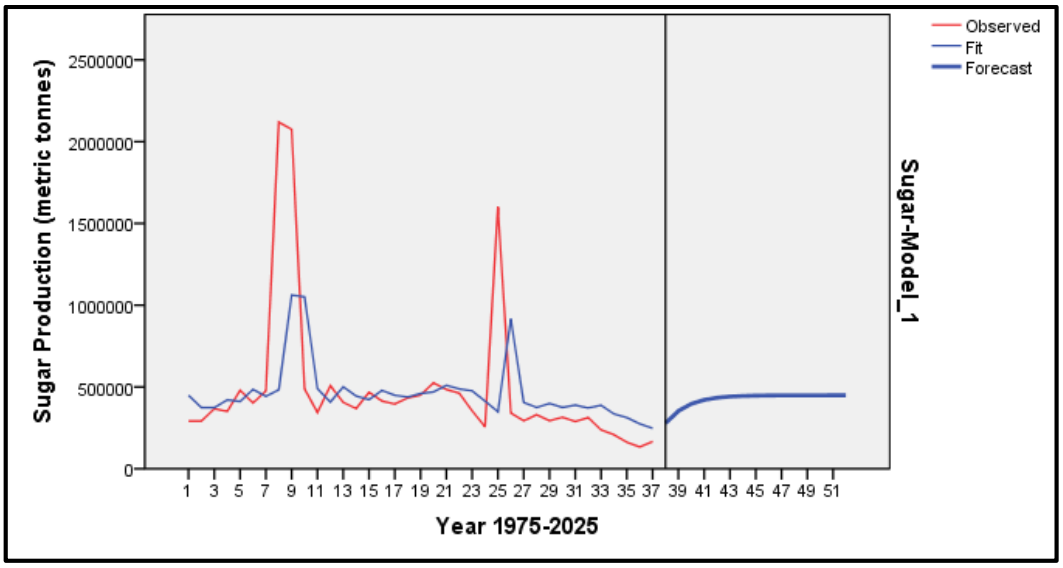

Figure 9.1: Forecast of sugar production level until the year 2025

The SAP has also proposed that the additional 9,000 hectares to be brought into production be directly under FSCs management (p10 and 74). This is in line with the FSC's strategy of expanding to 30 percent the sugarcane farming area under its direct management (p64). This has the potential, however, for creating further tensions between farmers and the FSC, with farmers fearing that their farms might be withdrawn from them and given over to the FSC. This would result in farmers losing ownership of formal land titles and them being displaced to different squatter settlements around the country, as in the view of MoS, it would be difficult for the Government to relocate and/or resettle these farmers elsewhere (MoS, 2015: Semi-structured Interview). In the view of the MoA, it is vital that the Government retain the existing cane farmers on their farms by providing them with better facilities and amenities (MoA, 2015: Semi-structured Interview).

9.3.2 Farmer Responses to Land Expansion

Of more concern to the sugarcane farmers than the expansion (or retention) of land for sugarcane cultivation is the threat of non-renewal of land leases (Lal et al: 2001) that they have been facing since their 30-year-leases under the ALTA (1976) started to expire in 1997. The farmers' position is that something should be done to increase the security of their land leases, i.e., that they should be entrusted with long-term lease extensions of 99 years or more once their initial lease has expired.

The non-renewal of land leases has been the primary problem for the past twenty years. However, some farmers do acknowledge the current Government for

assisting with the land lease issues by negotiating with the native *iTaukei* landowners for the renewal of the already expired leases. In order to achieve this, the Government has compensated the landowners with a 4 percent down payment of the total 10 percent of the Unimproved Capital Value (UCV) of the land being leased under the ALTA (1976). The farmers paid the remaining 6 percent (MoS: 2015).

Although farmers have started to have the lands re-leased to them, there are certain costs attached to this. Farmers in Labasa told me that some of the re-leasing had been on marginal lands where the soil is too acidic, and requires the application of Aglime which sells for FJ$10-16/40kg bag (Chaudhary: 2015k), and is an added expense for farmers (Labasa Farmer: 2015). Another problem associated with marginal lands is its topographic characteristics, for instance, its hilly and sloping nature. Such land requires continuous protection from erosion or being washed away during heavy downpours by using contours and planting *vetiver* grass throughout the year. *Vetiver* grass has a very deep rooting system that assists, with contours, to help prevent soil loss.

9.3.3 Increasing Yield per Hectare (Land Intensification)

There are two aspects to land intensification. First, deviation from the normal practices of traditional farming (including new varieties of sugarcane), and second, the maximum utilization of a unit of land. To implement these actions, responsibility has been given to FSC and SRIF, with added support from the Producer Associations, FT and the EU.

9.3.3.1 Dual Row Planting

Under the current system of land intensification, the farmer is required to shift from the traditional system of single row cane planting to an intensified dual row system, as illustrated in Figures 9.2 - 9.6.

Figure 9.2: Construction of furrows and placing of Aglime
Source: Author

Figure 9.3: Cane seedlings are placed in furrows and draped with Aglime
Source: Author

Figure 9.4: Cane seedlings are cut into smaller portions
Source: Author

Figure 9.5: Cane seedlings are sorted
Source: Author

Figure 9.6: Cane seedlings are then finally covered with soil
Source: Author

The advantages of dual row cane planting are said to be that it can control soil moisture (SRIF: 2015, Semi-structured interview) and allows for better aeration and light leading to faster growth. In addition, because of wider rows, cane leaves are more exposed to light that permits higher rates of photosynthesis, hence higher sugar content (Soomro et al: 2009). The dual row concept can also accommodate intercrops with profitable returns for the growers (FSC: 2015, Semi-structured interview), without any depressing effect on cane yields (Klomsa-Ard et al: 2007). The system can accommodate some green manure and legume crops for improving land productivity, and is best for managing the succeeding ratoon crop (SCGC: 2015, Semi-structured interview).

9.3.3.2 New Cane Varieties

Other forms of intensification requiring deviation from traditional practices is the introduction of new cane varieties. The SRIF, as the research arm of the sugar industry, is under pressure from the government to strengthen cane varieties research and avail good quality seed cane to growers.

> "Our job is to carry out research and develop new varieties that will give more yield and more sugar. This is something from the research perspective that we would like to take to the growers" (SRIF: 2015, Semi-structured Interview).

The focus is on the utilizing of scientific methods to produce promising new cane varieties for increasing farm productivity. At the moment, the focus is on producing sugarcane varieties that are high in sugar content, flexible enough to adapt to the changing conditions of soil and climate, and resilient to parasites and diseases. To this end, the SRIF has developed two new sugarcane varieties: (i) *Viwa* (LF04-448) and (ii) *Qamea* (LF94-694) that were released in 2014 (SRIF: 2015, Semi-structured Interview).

Viwa Variety:

According to SRIF, this variety shows promise and could be released nationally for commercial production after further farmer feels effect evaluation (SRIF: 2015, Semi-structured Interview). This variety is mid-late season maturing with average sucrose content (SRIF: 2014a). LF04-448 has thin, very tall erect stalks and shows good tolerance to lodging. The data of LF04-448 for cane and sucrose yields shows it is comparable to commercial varieties in the large plot trial. It is capable of producing 70 tonnes cane/hectare on poor medium soils under rainfed conditions. This new variety was selected from the bi-parental cross LF97-29[40] x LF70-610140 that was bred in 2004. The female and male parents are hybrids from the Germplasm collection. This new variety has shown good

[40] The listed varieties do not have any local names. These varieties have been used as a parent in breeding new varieties, and they have been assigned numbers. Only varieties that are released for commercial planting are given names (SRIF: 2017, Personal Communication).

potential in the trial and likely to be a leading candidate for mechanical harvesting. It also has slightly higher fiber content that would be useful for co-generation. The variety germinated in 10 days if situations are favorable and tillering produces 6-7 stalks per stool under normal growing conditions. It is also highly resistant to the FLGD, mild to rodent attacks and moderately resistant to borer damage (ibid).

Qamea Variety:

According to SRIF, this variety shows a lot of promise and could be released for commercial production after the farmers feel effect evaluation (SRIF: 2015, Semi-structured Interview). This variety is early-mid season maturing with good sucrose content compared to the dominant existing varieties and has favorable agronomic characteristics (SRIF: 2014b). The data of LF94-694 shows an outstanding performance in cane and sucrose yields at the adaptation trials. This new variety was selected from the bi-parental cross *Mana* x LF58-602340 that was bred in 1994. The female parent *Mana* is the dominant variety of the industry and accounts for 70 percent of the total production. The male parent LF58-6023 is a hybrid from the Germplasm collection. This new variety has shown good potential in the trials and likely to have an impact on the sugar production. The variety also germinates in 10 days if situations are favorable and tillering produces a high number of stalks per stool under normal growing conditions. Just like the *viwa* variety, it is also highly resistant to the FLGD, moderately resistant to borer damage and downy mildew (ibid).

These new cane varieties have been developed to replace varieties that were high in tonnage but low in sugar quantity and quality, and will have implications for the sugarcane payment system. Up to now, farmers have been paid according to the tonnage of cane produced and the older varieties of canes had been deficient in the preferred sugar contents. This was to the disadvantage of the FSC because the market price is determined by the sugar quality. For this reason, FSC, plans to change the payment system to one based on sugar quality. To facilitate this, the FSC, with the Government's support, brought in the Near Infrared (NIR) machine which is able to measure the amount of sucrose in a sample of each farmer's

harvested crop as it enters the mill. According to the FSC Chairman, under the 'Cane Quality Payment System':

> ……every farmer irrespective of what quality cane you give me will get paid a minimum price, so the farmer that gives us better than what we believe is the average cane quality deserves to be paid a premium. Over the past four or five years as part of the restructure of the whole industry, we have been asking farmers to plant three different varieties; these are early maturing, mid-maturing and late-maturing. The early maturing cane is harvested early in the season and so on. So this gives farmers lot more dollars in their pockets because they will be able to provide with the right quality of cane and obviously the premium price will be paid. If we look at the yield per average at the moment, it sits around 47-48 tonnes per hectare, if you look at the world-class, it sits at 120 tonnes/hectare, so we have a long way to go…… (27th September 2015, Fiji One News).

With the introduction of the NIR machine, farmers will have no option but to adapt to the new 'cane Quality Payment system'.

9.3.3.3 Amalgamated Farming Systems

The third method of intensification is maximizing utilization of land by introducing Amalgamated Farming Systems (AFS) (The Sugar Industry Stakeholder Action Group: 2012, 70). Under this system, farms will be joined together and employees hired to farm the cane fields intensively. This would involve reviewing the agreements that the farmers currently have in terms of land leases and boundaries, and the investments that they have already made on their farms. Another method by which Amalgamation can be achieved is by withdrawing all lands from both active and non-active growers and re-contracting them. Such a move may be already underway without it yet having being made public, as a few farmers informed me that they had been visited by officials and that there already was talks about this. The SAP (The Sugar Industry Stakeholder Action Group: 2012, 70) has provision for a 'Grower Retirement Scheme' whereby growers can transfer their lands to the SCGF for an interim management period. The grower would then receive monthly installments and be able to stay in his house. In parallel, new

entrants will be trained under the MoS and other relevant training providers such as the FSC and SRIF.

9.3.4 Farmer Perceptions of Intensification Measures

The new methods have received a mixed reaction from the growers (Focus Group Discussion: 2015). On the one hand, a significant number of farmers, particularly from Lautoka, Ba, and Nadi, feel that intensification of the sugarcane fields can assist them in getting out of the 'death trap'. These farmers own large areas of land and farming machinery. For others, however, the dual row planting technique means a complete change in their farming practices and the adoption of new varieties of canes. This group of farmers prefer to maintain their traditional varieties and traditional methods of cane farming.

The many growers whose perceptions of farm intensification are based on their ancestral knowledge remain skeptical of the new techniques proposed for intensification. The methods, skills, and cultural farming practices that they employ have been passed to them by their parents and grandparents over four generations. Today, such knowledge is most evident in the areas of Sigatoka, Tavua, and Rakiraki. The farmers at these locations informed me that the practices used by their forefathers to ensure maximum utilization of their farms will result in high yields of sugarcanes, but without disturbing the natural ecology of the cane fields.

> "Hamaar baap dada bataat rahin ke agar ganna mango howao…Ghana Ganna…chale ke jagha nai mango raho bich me…par kheyal rakho ke khet ke hani nai pahoche" [My dad and grand-dad used to tell me that if you have to grow cane…grow intensely…there should be no space left for even people to walk in between when the cane has grown and matured…but ensuring that the farm is well maintained and looked after without any negative impacts to it]. "Ganna ke khet mei agar kisan acha kissani kari bahot mota paisa hai…u logon to matti ke dekhat raha…dekhat raha ke khet mei aisan kuch nai kara jawe ke khet ke hani pare" [if the farmer works hard and smart on his farm, then the returns are high…the older generations used to understand their soil…they used to ensure that they do not do anything that will bring undesirable

consequences. If you have good farm size, you can plant cane and also plant cash crops] (Nadi Farmer: 2015).

Traditionally, increasing productivity is dependent on how well the farmer utilizes his skills, soil, agrobiodiversity, and time. The older generations used to intensify production by planting seasonal vegetables like *boda* bean (legumes) that can be harvested before the cane plants reach their secondary growth. This assisted the farmer and the farm in various ways. The roots of the legumes provide the soil with nutrients, the bean seeds are used for household consumption, and the produce can be bartered in exchange for other useful products, or sold off for additional incomes.

When asked about the traditional practices and methods, the research respondent at SRIF stated that the forefathers of the current pool of farmers gathered knowledge based on trial and error methods of practice since CSR days, and have passed the accumulated knowledge to their descendants. In those days, he said, there were no systematic means of teaching the cane growers on how to manage their farms, which they did on their own. The trial and error methods consequently became traditional methods for cultivating cane. At the same time, the SRIF respondent insisted that cane growers should break away from traditional methods and move to new technologies and practices in order to achieve greater yields and reclaim the dying industry.

On one occasion during a focus group session in Labasa, I was introduced to a trial and error method of increasing productivity, involving a completely different method of intensifying cane production. The technique involved the 'dual row overlap' concept of planting and growing canes. The FSC Field Officer had experimented this technique with one of the local farmers on his sugarcane farm. The technique is similar to the one illustrated in the Figures 7:1-7:5, except that it involved overlapping of cane seedlings. He said that his idea, as illustrated below, had the potential to increase cane yields two-fold.

For an acre of land-

> **Scenario A:** with single row planting of cane, the farmer produced 64 tonnes and if cane price is FJ$73.00 minimum, he receives a payment of FJ$4670 With overlap planting of rows of cane, a farmer would have received a total of FJ$6490.

Scenario B: with dual row, if one produces 131 tonnes per acre, his revenue increased to FJ$9563 and with overlapping, he received approximately FJ$12600.

Logic: The area remained constant but the change in yield was due to change in farming techniques.

This result seemed outstanding at first, but there are many limitations to this technique. The growers informed me that it may increase stalk output, but would generally decrease the health of the plants, impacting their root systems. According to the farmers, each individual cane plant root system requires ample amounts of space between them. They informed me that with such an intensification method, the competition for space and nutrients by the plants would increase. I was also told that it would be difficult for the farmers to manage weeds and pests once the plants had reached secondary growth as such a type of intensification would restrict access for the farmers to be able to clear weeds and pests later on.

9.3.4.1 New Cane Varieties

There is considerable reluctance among farmers to accept the new cane varieties. The farmers on Viti Levu still consider the *Mana* variety as 'King' variety, because for them, this variety is able to grow anywhere, and under any circumstances (MoA and MoS: 2015, Semi-structured Interview). The farmers feel that traditional varieties such as *Mana* are resilient to droughts and hurricanes, which helps in difficult times, and it is capable of growing in almost any soil type. This means that the farmer is less burdened by the applications of costly fertilizers that the new varieties require in order to grow well. Cane belts on Vanua Levu are devoid of *Mana* variety, but other varietal spreads are significantly wide on that island.

The issue has become a matter of public debate with the FSC Executive Chairman quoted as saying that it was up to the farmers if they want to continue planting traditional varieties such as *Mana*, but that they should take the FSC's advice about planting more than one variety of cane (Chaudhary: 2015f, 30). The National Farmers Union General Secretary, Mahendra Chaudhary stated, that traditional varieties such as *Mana* had proved to be resilient and lucrative as a crop for many years, that such traditional varieties had proven their worth by withstanding natural

disasters, and the move away from planting such traditional varieties into planting the new varieties did not make sense.

Some growers who have been experimenting with the new varieties proposed by the FSC and SRIF did acknowledge that the new varieties have higher sugar contents. Other farmers, however, faced some serious setbacks associated with these new varieties. For instance, one farmer from Sigatoka and another from Nadi informed me during my visit to their farms that they had bought the seedlings of the new cane varieties and planted them, but unfortunately the seedlings were unable to grow. Similar statements were shared by other farmers in Rakiraki where the new varieties such as the *Kiuva* - a variety launched in 2009 - kept producing lower cane yields (James: 2013).

Given the farmers' reluctance to adopt the new methods of planting, the above approach to intensification has tended to be coercive in nature. According to one FSC Field Officer, "the farmer needs to get himself acquainted with the market and should be able to understand the benefits of this approach; then their ability to intensify should not be a problem". In a harsh and heavy tone, the farmers attending a focus group in Labasa were told to stop complaining about the changes and adopt them in order to increase their farm productivity and income. The Sector Officer also tended to support the FSC Field Officer, stating that sugarcane farmers should not complain about the preferential prices, should do away with the "cannot be done" attitude and learn from other farmers in Fiji who are able to produce 100 tonnes of sugarcane per hectare (Diary Entry: 2015).

Assisting the SRIF and FSC in getting farmers to adopt these new varieties in their cane fields is FT who together with SRIF and FSC have come up with a project named 'lead and link farmer concept' to support and accelerate farmer adoption of the two new varieties (SRIF: 2015, Semi-structured Interview). This concept identifies the 'lead farmer' to act as the 'messiah' whereas the 'link farmers' acts as 'disciples'. The lead farmer grows the new varieties first on his farm, and once the project is successful, invites and convinces the link farmers to grow the same varieties. While the 'lead farmers' are in the forefront of implementing the 'lead and link farmer' concept, behind the scenes, the concept is facilitated by

organizations such as SRIF, FSC, and FT (LCPA: 2015, Semi-structured Interview).

The industry's aim is to slowly change the attitudes of farmers towards the new cane varieties such as the *Viwa* and *Qamea* - the former variety being able to produce high cane yield and high sugar contents, whilst the latter is able to produce high fiber contents that can be used for electricity generation. The FSC Executive Chairman stated that *"basically, what we are doing is giving them information and knowledge and the onus will be on them to make the necessary adjustment*s*"* (Chaudhary: 2015j, 30). Yet, according to the farmers, these varieties are non-resilient and unable to grow in diverse climatic conditions such as the traditional *Mana* variety. They are of the view that they should continue to cultivate the traditional *Mana* variety. The *Mana* variety makes up more than 90 percent of the total cane crop on the island of Viti Levu (SRIF: 2015, Semi-structured Interview).

The FSC maintains that the system does not impose any additional costs on the farmers, but the farmers feel that it does. It means that farmers will have to make changes to their farm practices in order to maintain the quality of cane supplied to the mills. Also, for the farmers to benefit from this change, the FSC will have to iron out transport and milling issues so when farmers harvest their sugarcane they are able to transport their canes to the mills the same day, as the longer the cut canes are kept in the fields, the more the quality of the cane is affected. One respondent from the Labasa Cane Producer Association (LCPA) informed me that pushing the growers to adhere to planting new varieties of the sugarcane is absurd when the FSC itself does not have a quality milling technology, and has a history of milling inefficiencies. Farmers should instead, he said, be compensated for the inefficiencies of the FSC, such as for the waiting time that farmers have to endure before their harvested cane is weighed and dumped at the mill's dumping sheds, as deterioration of harvests during the waiting time affects the quality of cane. He also commented on the problem of untimely payments to farmers. His proposition was that the Government should forecast the price of sugar each year, and the FSC should buy the canes directly from the farmers at an agreed price, or the farmers should sell the canes to the cane associations in their milling areas and the FSC then buy from the cane associations. This, he said, would allow for higher levels of transparency and accountability (LCPA: 2015, Semi-structured Interview).

When asked about what will happen if the farmers are unwilling to accept the new techniques of intensification proposed by the FSC and SRIF, the SCGC stated that *"the system on its own will force the growers to adapt to the new practices and varieties as soon as the cane payment system is fully operational"* (SCGC: 2015, Semi-structured Interview). One farmer informed me that it was sad to note the comments made by the SCGC, which is supposed to be the 'voice of the farmers', but in fact has joined the other dominating stakeholders such as the FSC and SRIF in compelling its own people (the growers) to adapt to the new practices and methods of farming. Another farmer stated that they have lost confidence in the SCGC. They see the situation now more as one of it 'biting the hands that feed you'. The growers, time and again, during focus group discussions and informal interviews, protested that the SCGC has failed to deal with issues from the farmers' interests and standpoints (Focus Group Discussion: 2015, Tavua-Rakiraki region).

9.3.4.2 Amalgamated Farming System (AFS)

The AFS may be beneficial at the industry level, allowing more intensive use of the cane fields, but to be effective it will have to be done equitably, and with the willing participation of the farmers (SCGC: 2015, Semi-structured Interview). As things stand, there seems to be very little farmer acceptance. Instead, there is concern that, if AFS comes into full force, it will degrade the farms, as their management will be in the hands of a completely new set of young farmers who have no experience or knowledge of cane farming, other than the training provided by the FSC and SRIF, or the MoS. Secondly, there is concern that the AFS will require re-settling the farmers elsewhere, or the phasing of them out of the system altogether. Under the 'Industry Reform Action Plan' of the SAP, those farmers who are deemed 'underperforming registered growers' will have their farming lands released from them, and there is concern that the main motive of introducing AFS is to do away with those farmers who are unwilling to accept the changes that the industry wants to bring about. Although the change to AFS is supported by the key actors in the industry, such as the MoS, FSC, SRIF and SCGC, farmers are reluctant to accept this approach and remain protective of the current model of 'one farmer one farm'.

Some farmers believe that the ultimate goal of the FSC in taking the step of intensification is to take the majority of farms under its management in order to manage farmers who are non-responsive to the desired changes.

> "E to saas pato wala khel hai…FSC saas hai aur humlogon pato hai…hum logon ke maange wai karwaye jon u logon maange hai" [the drama here is like that of the 'mother-in-law' and 'daughter-in-law'…FSC is the 'mother-in-law' and we farmers are the 'daughter-in-law'…they want us to do things what they think are correct] (Lautoka Farmer: 2015).

I estimate that at least 80 percent of farm leases are held by older farmers who are unwilling to undertake the changes that the industry is rushing to bring in, and taking the farms under FSC management would be one way of eliminating them from the industry, and bringing in new farmers who will do as they are told.

> "They think they can bring in productivity by such an approach…forget it…it is not going to work…they need us…we are the hardworking ones…the new generations know nothing about cane farming…even if they push us all out of the system…they are already a failure…they will fail badly again" (Master Farmer: 2015, Sigatoka).

The concern is that innovative concepts such as Amalgamation and shared farming that have been developed in many other countries, for example in Mauritius, to increase cane productivity, will not work for Fiji given the current circumstances, and the way the industry and the farming systems are structured. It will push the farmers further out of the cane belts and force them to take shelter at the squatter settlements on the outskirts of urban centers. This will be unfortunate for the farmers, but it does not mean that it will not work in making the industry more efficient.

Another concern is that intensification can lead to over utilization of the farms making the soil weaker and lessen its fertility. It may also allow for unsustainable practices such as increased burning of canes and increased reliance on fertilizers, pesticides, and herbicides. Mahadevan (2008) states that it is necessary to implement an effective incentive system to make it worthwhile for farmers to adopt soil conservation measures if Fiji was to venture into intensification. However, the plan for intensification of cane farms in Fiji has resulted from the push of the

stakeholders such as the FSC and SRIF to increase crop harvests, with lesser emphasis placed on sustainable and/or conservation farming.

The move to intensification through amalgamation of small farms can also be contested. For instance, in the Philippines, Padilla-Fernandez and Nuthall (2012) examined the productivity efficiency of sugarcane production across farm size. Their results indicated that small farms were not as economically efficient as the larger ones. Therefore, from an economic point of view, the move towards larger farm sizes could be seen as beneficial in terms of increasing the production of sugar in Fiji if the same principles as those on which medium-large size Philippine sugarcane farms operate were followed. The advantage of larger farms is their ability to take advantage of economies of scale and purchase inputs at a lower price. This allows them to apply more inputs and generate higher production, whereas smaller farms face higher input costs and therefore use fewer inputs. Hence, they have lower production. Silici (2014), however, argues that managing complex and synergistic systems is easier in small farms because they are more labour-intensive and because labour is usually very productive on farms practicing agroecology, i.e. there is a high return per unit of input (Altieri et al: 2012). In addition, it was noted during the fieldwork in the Tavua-Rakiraki region, that among smallholders who shared local resources, relationships of trust and reciprocity lead to efficiencies (Personal Observation: 2015). Osturm (1990) states that such efficiencies are not available in centralized farm systems controlled by a few large actors (cf. Ostrom: 1990).

9.3.5 Increasing Milling Efficiency

Inefficiency of sugar mills in Fiji has long been a problem for the industry and the SAP has required that a new technical and operational benchmarking of the sugar milling factory performance be introduced. This requires measurement against similar sized factories, preferably in India, Africa and Mauritius. The initial review notes that FSC mills are already operating at comparative levels in some areas, but not all, and that there is room for improvements, which the FSC is now striving to achieve. As identified by the SAP, most of the milling technology is more than 100 years old, and the machinery needs continuous upgrading and/or replacement.

In July 2018, the FSC reported that reforms in the mills have had positive outcomes. For instance, the Labasa mill's efficiency levels had increased significantly from 77 percent in 2017 to approximately 97 percent in 2018 (Tuilevuka: 2018). Similar efficiency levels were recorded in Lautoka, where, in 2018, the Lautoka mill was able to crush a total of 21,325 tonnes of cane compared to 19,078 tonnes the year before. The daily time efficiency levels also increased from 77 percent to around 94 percent. For the growers, this will cut the waiting time for the canes to be processed and also allow for minimum disruptions during the harvesting and milling seasons.

Not all problems are resolved. On the 16th of August 2018, I observed the closure of the Labasa Mill due to technical issues. By the time the Mill started operations that night, many cane lorries was clogging the mill road waiting to dump their harvested canes (refer Figure 9.7). The drivers complained of long hours of waiting in the cold, with no proper shelter or food at the Mill.

Figure 9.7: Farmers waiting at the Labasa mill to dump their canes in the night
Source: Author

9.4 Diversification

Another proposal for salvaging the cane industry is to move towards diversification by venturing into capital projects and cash cropping. Capital projects will consist of process centers for converting raw sugar into other value-added products to provide additional sources of income.

9.4.1 Diversification at the Processing Level

At the national level, if Fiji is to retain its international markets, it has to diversify its sugar production by generating a range of value-added products, instead of focusing solely on raw sugar (Chaudhary: 2015e). This is because markets such as the UK demand different categories and types of sugar, such as organic, plantation, white, and brown.

Other solutions are to fast track the implementation of sugar packaging plants; co-generation power plants of 35 megawatts capacity in Rarawai and 10 megawatts in Labasa; an ethanol production plant in Lautoka; and a sugar refinery in Labasa. These it is thought, will cushion the impact of global price volatility and aid in buffering the economic impact of the end of the EU quota access in September 2017 by producing for local consumption (MoS: 2015, Semi-structured Interview).

> Packaging plants have been set up where Fiji will pack their own products, market it in the local and regional marketplaces that would bring in some additional incomes whilst co-generation would result in selling of electricity to the national grid which is believed to fetch a good revenue. The newly commissioned heat and power plant at the Labasa mill will run on *bagasse*-dry pulpy residue left after the extraction of the juice (MoS: 2105, Semi-structured Interview).

Further to the above, Fiji will have to become competitive enough in relation to other producers to tap into its own local and regional markets. So far, the FSC has failed to diversify its products and as such, they have not managed to capture its own local market. For instance, the hospitality industry in general, including hotels and resorts in Fiji, tend to utilize sachets of different brands of sugar imported from overseas.

The co-generation power plant project worth $17 million, financed by the Fiji Development Bank (FDB), will benefit the North of Fiji (Vanua Levu) as the mill there will be able to produce electricity not only during the peak crushing season but also to sell to Fiji Electricity Authority (FEA) during the off-season (FDB: 2016). Approximately 6-7 megawatts of energy are used in the factory itself, and the rest will be sold to FEA throughout the year. This will see Labasa mill earning revenue additional to that from the sale of sugar and molasses.

> The ethanol production plant will be a source of clean and renewable fuel whilst the refinery will be used to produce refined sugar that tends to fetch prices three times higher than the normal brown sugar (SCGC: 2015, Semi-structured Interview).

The FAO predicts that global sugarcane production will increase by 21 percent, and that the share of global sugarcane production processed for ethanol is set to expand from 20 percent in 2012-14 to 25 percent by 2024. The major concern of the industry is the time it will take to get such projects up and running, and how the benefits will be distributed.

> "Pata nahi kab se e logon bole hai ke e plant bani, u plant bani, sab koin to bolis hai…par e sab to dekhe wala baat hai…paper pe to koi bhi sake likh ke bataye dewe ke e khara kardi u khara kardi…par aaj tak to kuch dekhe nai mila hai…" [We have been hearing a lot that they are going to build this and that…everyone has been telling us about this for a long time…all this can be written and presented to us on paper…but in reality, there is nothing that has been executed] (Rakiraki, and Labasa Farmer: 2015).

Other concerns are that the long-term profitability of these projects will require an increased and stable supply of canes, and this will be possible only if the number of farms is expanded and the farmers remain motivated to increase production. The profitability of biofuel production is also under pressure from low non-renewable fuel prices (OECD/FAO: 2016).

9.4.2 Diversification at the Farm Level

It has been proposed that the dual row planting system (refer Section 9.3.3.1) intended to increase production levels should simultaneously include intercropping of cane plants with cash crops. A technique known as diversified farming. Up to now, the smallholder sugarcane farmers in Fiji have been mono-crop producers (Lal: 2004). This is because CSR discouraged diversification and the FSC followed the same policy when it took over from CSR in 1973. The Government now sees diversified farming as a means of generating additional incomes to help the poor sugarcane growers and encourage for rural development. For this to take place, farmers will have to move from traditional methods of single row cane planting to dual row planting that FSC and SRIF are trying to implement.

SRIF would like farmers to move away from the practice of intra-cropping[41] and move into intercropping[42].

> The practice in Fiji has been intra-cropping. This is because farmers have been engaged with mono-cropping of cane only, but with different cultivars. Farmers have planted cane once and it has been growing there for 55 years. Since then, there has nothing been done to improve the health of the soil. This is the major issue that we have in the cane belts and this is continuing…we are trying our level best to reduce the timeline for planting and the number of years we would like to keep the cane. Farmers should also start with planting cash crops along the rows of canes (SRIF: 2015, Semi-structured Interview).

According to MoA, there are plenty of vacant lands available within the cane belts on which other crops could be grown.

> For us at the Ministry, it is planting of other crops due to a high return on investments. However, this is dependent on the availability of the market

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[41] Intra-cropping: Growing two or more cultivars of the same species simultaneously in the same field. Another level of intraspecific diversity is sometimes attained by growing genetically heterogeneous cultivars of the same crop (Allard, R. W. 1999. Breeding for Low-input Agriculture. *Principles of Plant Breeding.* Second ed.: John Willey & Sons).

[42] Intercropping: Growing two or more crop species in the same field at the same time (interspecific diversity).

> and the ability of the farmers to do it with continuous supply and the type of product quality that is required. We cannot be pushing for something when the market is not available (MoA: 2015, Semi-structured Interview).

I was informed by the SCGF and SCGC that they have assisted farmers with other alternative sources of livelihoods such as cow's milk and establishing beehives.

9.4.2.1 Improvement of Key Services in Agriculture (IKSA)

One important project currently being undertaken to improve rural livelihoods for Fiji's sugarcane farming communities is called Improvement of Key Service to Agriculture (IKSA) - an EU-funded and SPC implemented project (SPC: 2015). The IKSA project with the assistance of International Trade Centre (ITC) seeks to strengthen the CPA's and provide support to the cane growers for diversifying into the planting of horticultural crops (SPC: 2015, Semi-structured Interview). The project encourages sugarcane farmers and other types of farmers in the sugarcane belts to supplement their income through growing fruits and vegetables on unused or marginal land, and through intercropping with sugarcanes (refer Figures 9.8 - 9.12).

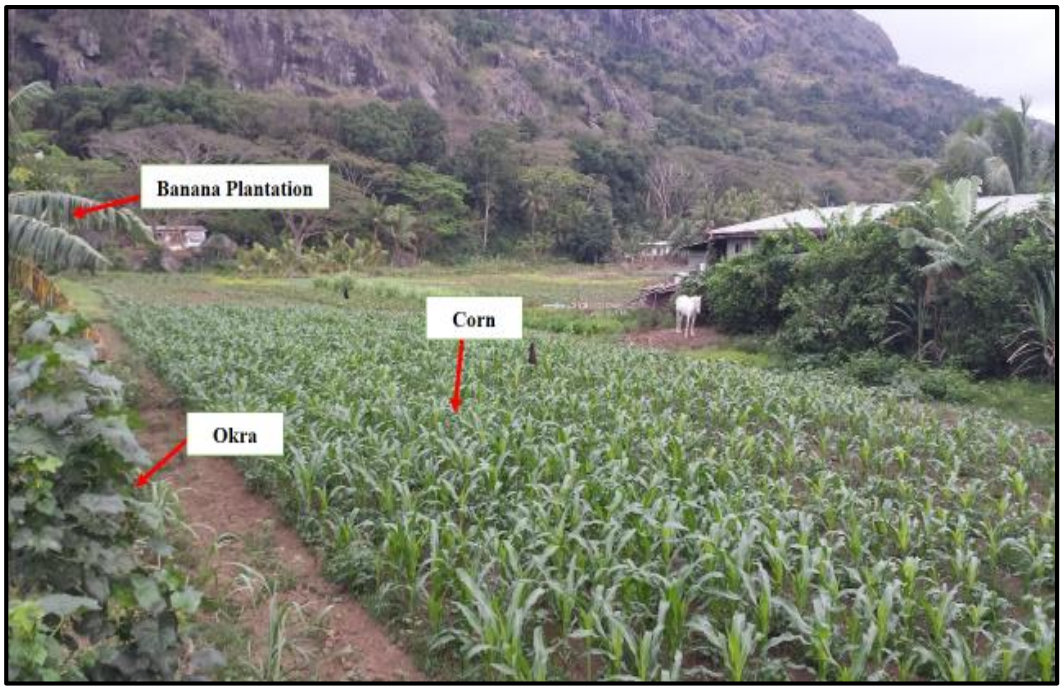

Figure 9.8: Nadi farm
Source: Author

Figure 9.9: Ba farm
Source: Author

Figure 9.10: Tavua farm
Source: Author

Figure 9.11: Sigatoka farm
Source: Author

Figure 9.12: Nadi farm
Source: Author

The Improvement of Key Services to Agriculture (IKSA) project was implemented in 2012 without any pilot research being carried out, and according to the SPC officer, it was still in its infancy stages in 2015. This is because they were challenged in getting the farmers accustomed to the system of intercropping and value adding into their fields in order to increase outputs and generate other sources of income.

The farmers' position on intercropping is that they can only cultivate crops that can be grown and harvested within short time periods (one to three months) between planting cane seedlings and harvesting the mature cane. Those farmers who had taken part in the IKSA project were also faced with finding markets for their produce.

> "……In Seaqaqa, there have been a lot said about andras (referring to pineapple) farming and this has also been a flop project. There is no one to buy these products in the North……" [The farmers acknowledged the role of FT in providing them with seedlings for this project] (Focus Group Discussion: 2015, Labasa-Seaqaqa Region).

> *"…koi kuch bataye to koi kuch bataye…"* [Someone advises us to do this and someone else advises us to do that] (Lautoka Farmer: 2015).

> "Experience illustrates that such produce is sold below cost. A watermelon weighing 12-14kgs have been sold at $2.00 in the past and many times due to non-market access, most have been left at homes and in the farms having no value. Just because of this reason most of the watermelons were distributed to people free and in most cases, if not harvested would result in the watermelons deteriorating in the farms. In the local markets, middlemen ask for 30-50c kg for a watermelon. With these rate farmers at the very end, end up paying for the costs themselves from their own pockets. There is no way we think that the diversification strategy of the Government will work out" [All the members of the focus group had a unanimous feeling that there was no hope with diversification] (Focus Group Discussion: 2015, Labasa-Seaqaqa Region).

Pest and disease has also proved to be a problem.

> "……ham gawa mircha ke bia lawe che dola may… uske sathe hame batais, bolis ek gallon dawai $36 leke chal do…hum socha keto mircha le lo ya to phir dawai…aaj kal bahot jada…abhi to aisan chiz bo to oman to rakam rakam ke bemari aye jai…har makai jhar……" [I went to buy the chilly seedlings which I bought for $6.00…the shopkeeper said to buy a gallon of pesticide as well for $36 …I thought to myself that whether I should buy the seedlings or the pesticide…today too many…today we

plant crops and with that comes too many pests and diseases] (Focus Group Discussion: 2015, Labasa-Seaqaqa Region).

9.4.3 Problems of Market Access for Diversified Farm Produce

To overcome the marketing problem, the MoS and the EU/SPC have suggested the engagement of middle-men to buy the produce directly from the farmers. I was advised, however, by farmers in the northern division of Fiji that the middle-men were very cunning and highly deceptive in their approach. The farmers recalled instances whereby the middle-men had promised them that they would buy the produce at a certain price, and later had manipulated the market. Similar instances have been recorded in other cane farming regions of Fiji. A farmer in Nadi told me that "the middle-men will not buy from them until the market is flooded with the produce everywhere".

The strategy that these middle-men use to manipulate the market prices is that, firstly, they will ask the farmers to plant certain crops that they are interested in buying. A wholesale price is then agreed upon by the two parties. Once the crops mature, these middle-men then move across farms and create competition between the producers with the poor farmers being left with no choice but then to sell the produce at below cost prices to them. As a result, the more the delay in selling the produce, the more effect it will have on your harvests and accelerate the deterioration of the crops, as most of them cannot be kept on the shelf for longer periods. This is common for produce such as fruits and vegetables. I was informed by a farmer that:

> "There is a lot of produce but no available markets…when you make every farmer plant the same thinking the cost will be FJ$1.00 per bundle, eventually this gets flooded and the price comes down to 50c per bundle which actually means that the farmer is receiving money which is below the cost of production" (Sigatoka Farmer: 2015).

The middle-men are able to do this because there are no legal agreements or policies for safeguarding the interests of underprivileged farmers. As a result, those farmers who have tried to diversify their produce have become victims of breaches of trust. The farmers need legal contracts with the middle-men to protect them from

deceitful practices. This could also help growers to access loans from the banks as the contracts can be sighted as legal binding documents.

9.4.4 Other Problems Related to Diversification

Dr. Randy Thaman, an Emeritus Professor at the University of the South Pacific, believes that around 70-75 percent of the total produce sold at the local markets in the western and northern parts of Fiji comes from the sugarcane farmers (Personal communication: 2015). The Government is aware that some of the farmers' produce has limited market opportunities within Fiji. The MoA relayed that while there are limited markets available to sell these produce locally, there is still the existence of markets overseas such as in Aotearoa/New Zealand and Australia. However, these countries have strict levels of biosecurity compliance before the produce can reach their overseas markets (FBC News: 2013; Radio NZ: 2015).

On the question of profitability, a son of a cane farmer in Ba stated that some farmers make no profits at all from diversification. He stated that there are people in other professions, whom he knows, earning much better incomes from their small businesses.

He illustrated this with several examples:

a. THE CASE OF THE PIE SELLER:

He sells 100 pies a day $1 each in the streets of Suva and going to business houses just before morning tea time and makes FJ$100 a day, say his expenses are about $30 (milk, sugar, flour, baking soda, custard powder, and bus fares and taxi fares to travel that morning) so his profit is about FJ$70/day. Calculating it by 5 days a week by 52 weeks a year, annually he makes FJ$18,200.

b. THE CASE OF A VEGETABLE SELLER:

He buys a crate of capsicum at FJ$6/kg and sells it to Resorts at FJ$15/kg (10kg makes him FJ$90 profit). But daily he buys and sells just more than one thing like Beans at FJ$10/dozen x 20 dozen selling it at FJ$1.50/bundle making FJ$160 profit, Cassava at FJ$45/Bag and 10 Bags selling it for FJ$75/bag making FJ$300 profit among many other things like Pineapple, Watermelons,

Cabbage, Coriander, Tomatoes, etc. so his DAILY PROFIT is around FJ$1500, yearly being $468,000.

c. THE CASE OF AVERAGE WORKERS:

An average worker in Fiji (sales staff, receptionists, admins, call center, etc.) gets about FJ$80-$200/week being FJ$4160-10,400 per annum and if you're living in Suva, consider your rent. An average university graduate starts at FJ$12-16,000 a year with growing salary.

9.4.5 Farmer Preferences on Diversification

The observational data suggests that cane farmers in Fiji practice three different types of cropping: (i) either they designate farm plots in which they intercrop the vegetables separately from each other (refer Figure 9.13), or (ii) they keep home gardens away from the sugarcane fields where they intercrop with flowers (refer Figure 9.14), or (iii) they may also multi-crop with the sugarcane when the cane plant is only in its primary stages of development (refer Figure 9.15).

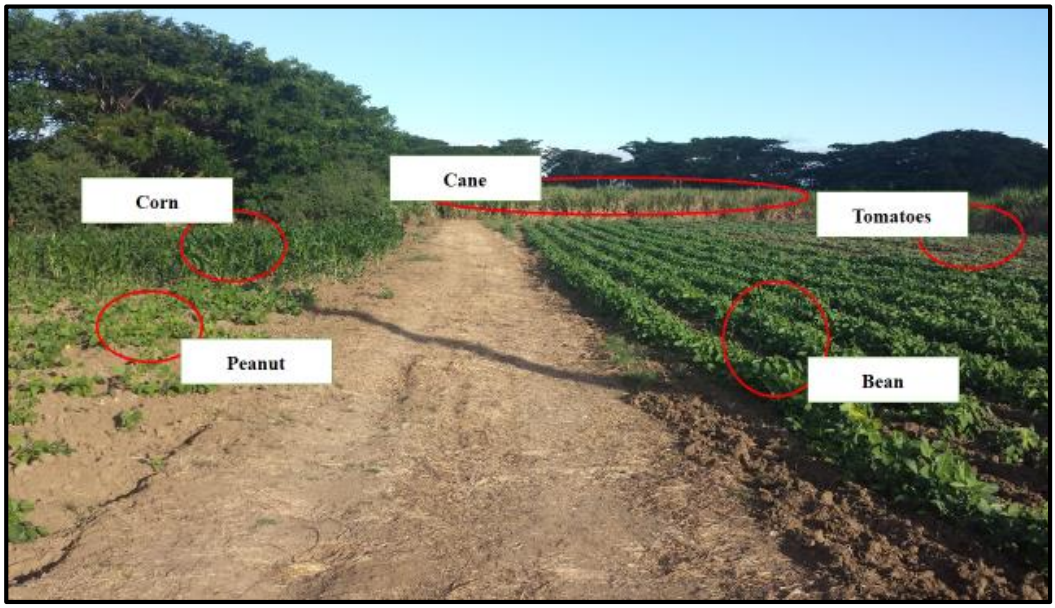

Figure 9.13: Nadi farm
Source: Author

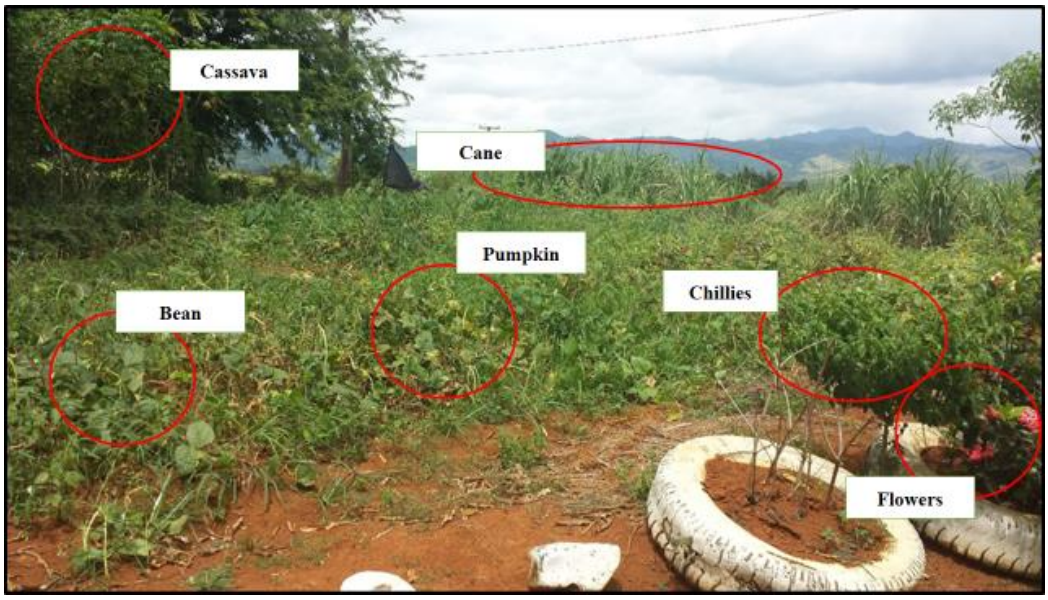

Figure 9.14: Labasa farm
Source: Author

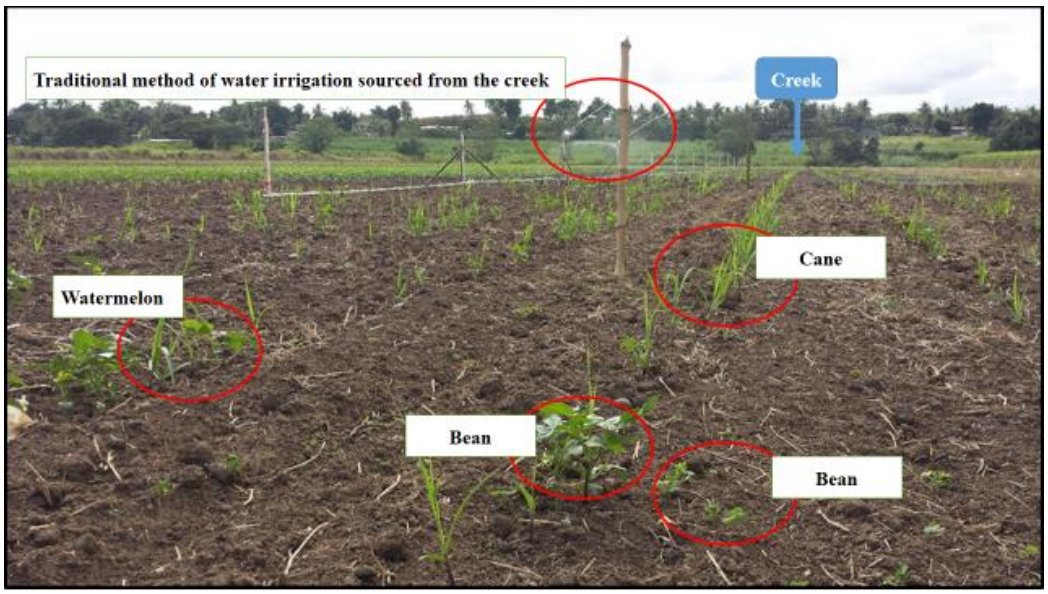

Figure 9.15: Lautoka farm
Source: Author

The intercropping of crops serves various purposes for the sugarcane growers. Apart from cash-cropping, certain crops used in intercropping can also help in improving soil fertility. I was informed by master cane farmer participants that the intercropping of *arhar* (refer Figure 9.16) and beans increased the fertility of the soil, and plants such as *neem* reduced pest infestations. The decision to intercrop and the choice of the crops are highly dependent on the advantages of the particular crop to the farmer and his farm.

Figure 9.16: Arhar planted around the borders of the field
Source: Author

9.5 Mechanization of Agriculture

Agricultural productivity can also be increased by incorporating modern technologies and fossil fuels. However, the financial cost associated with mechanization often puts it out of the reach of the poorest countries and people (Pretty: 2002). Regardless, the SAP (The Sugar Industry Stakeholder Action Group: 2012, 26 and 46) has established strategies for mechanizing the entire sugar industry in Fiji in order to improve efficiency in land preparation, harvesting, transportation, and milling, and according to MoA and MoS, this has to be done urgently. As the respondent at the MoA stated: *"we are totally in for mechanization…mechanization is the way forward for our country"* (MoA: 2015, Semi-structured Interview).

At present, some sugarcane regions in Fiji are more modernized than others, and some sugarcane farms are more mechanized compared to other farms in the same region, but overall, in the Tavua, Rakiraki, Sigatoka and Seaqaqa areas, the majority of farms remain non-mechanized and use more traditional farming practices. The regional differences in the prevalence of mechanization compared to traditional practices is summarized in the following diagram (refer Figure 9.17) (Field Notes: 2015).

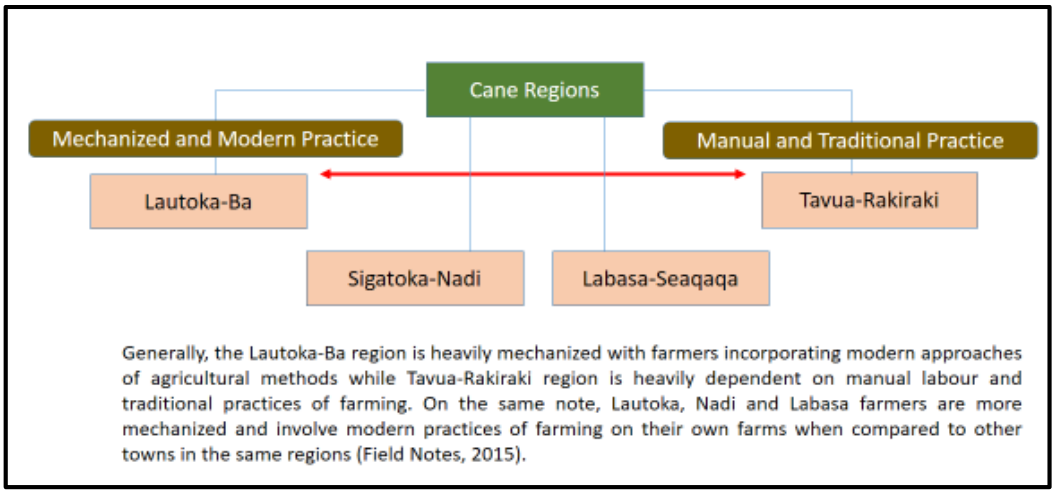

Figure 9.17: Differences in cane regions

There may be many reasons for this difference in level of mechanization, ranging from their financial position, cultural backgrounds, changing demographics, and environmental factors, but the majority of the farmers feel that mechanization of the cane agricultural system will not work because of the geographical topographies of farms in Fiji. For example, there are a lot of undulating hills and steep terrains.

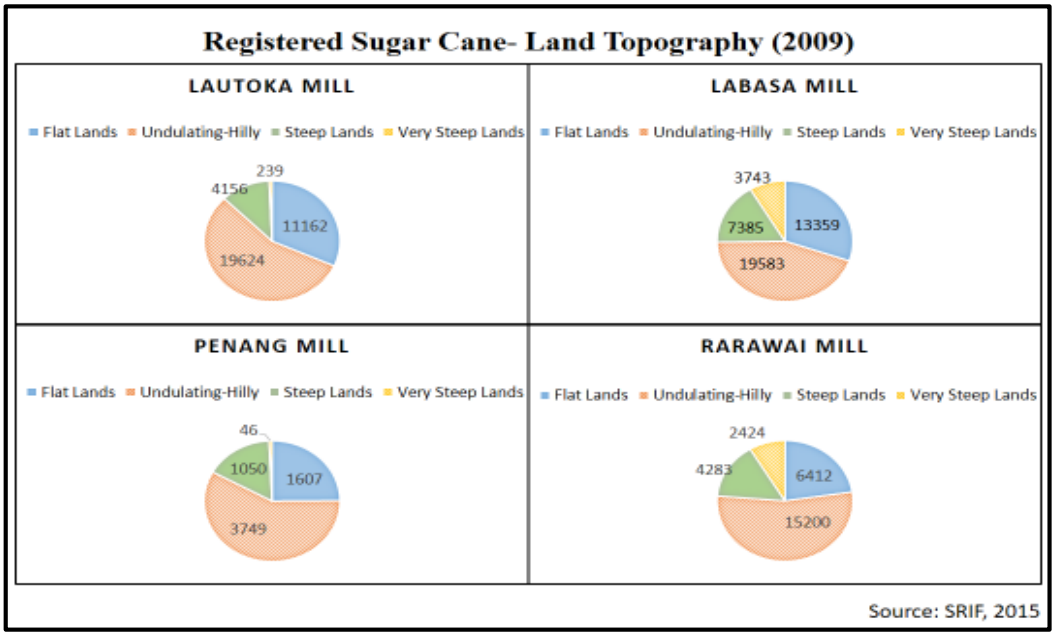

Figure 9.18: Total registered sugarcane- land topography (2009)

The 2009 data on the total number of land registrations for sugarcane illustrates that out of the total 114,022 land registrations, 71.5 percent (81,482 land registrations) ranged from undulating-hill to very steep lands (refer Figure 9.18). For this reasons, mechanization of the cane industry, especially the use of mechanical harvesting would prove impossible. Similarly, 20 percent of the total land registrations are for

steep - very steep lands under cane cultivation, therefore, the use of machinery such as tractors would also be very difficult.

9.5.1 Land Preparation

The Government is committed to accelerating the adoption of mechanized services by growers by improving their affordability and availability. This includes subsidizing the purchase of fertilisers, tractors and other farming equipment for land preparation (MoS: 2015, Semi-structured Interview). For example, the MoS informed me that a 50kg bag of fertilizer costs the growers FJ$45.59, with the grower paying FJ$31.50 and the balance of FJ$14.09 being subsidized by the current Government.

The MoS and MoA believe the procurement of technologies such as tractors for land preparation can affect the characteristics of grower households, for instance by decreasing their reliance on outside labourers, and can potentially help raise the income of smallholder cane growers by increasing the cultivation and sale of their traditional crops. That is, the same tractor can be used for cultivating other crops as well as sugarcane.

But the use of tractors is feasible only in areas that are low-lying and flat in nature, and majority of the land under current cultivation is undulating-steep-very steep in nature. This leaves the supply of technologies for land preparation uneven across different locations of the cane belt, and this was a concern for the MoS and MoA.

9.5.2 Harvesting

The shortage of cane cutters is an annual problem for farmers as many cane cutters are deterred by the insecurity of employment (which is only for few months in a year when cane harvesting season takes place). For this reason, the MoS and FSC have been encouraging the procurement of mechanical harvesters (refer Figure 9.19) that can be utilized on flat terrain areas where cane cutters are not readily available. The charge for mechanically harvesting cane can be somewhere from FJ$25.00 to $35.00 for a tonne (Labasa Farmer: 2015).

Prasad (2015b) reported that a new machine named ‘Case III’, manufactured in India and worth over FJ$380,000 was bought by a Navau, Ba farmer through a loan sourced from the FDB and a grant from FT. The machine had a capacity to harvest

100-150 tonnes of sugarcane per day and required only one person to operate it. However, the operator of the machine had to be hired from Chennai, India and paid FJ$800 a month. The owner of the machine stated that it will cost farmers FJ$28.00 per tonne for the harvesting and cartage of their canes. The MoS advised that, as of 2015, there were twelve mechanical harvesters in the country of which six were in Lautoka, three in Labasa and three in Rarawai.

Figure 9.19: Mechanical harvester and billet truck ready to harvest the cane, Lautoka Farm
Source: Author

9.5.3 Transportation/Cartage

The SAP does not include a detailed plan for transport options, but supports the FSC's investment in the 20km zone prioritized for railway networks around each mill. But there is a need to go beyond the 20km radius of the mill. The farmers informed me that those who live outside the 20km radius of the mill are the most disadvantaged, as they incur high costs of transporting their produce. Farmers stated that FSC should be taking up the burden of buying the produce from the farm gates.

> "The railway tracks only assist farmers who are closer and are in a 20km radius of the mill. If one moves further away from the 20km zoning then farmers tend to get less interested in intensifying because of harvesting and transportation, infrastructure problems, roads and lastly sugar price" (Sigatoka Farmer: 2015).

When I informed the MoS that farmers who lived outside the 20km radius of the mill had told me that they are farming at a loss due to the high costs of transportation

and cartage, the MoS respondent was surprised. His reaction was *"this is something new to me…this is news…we will have to look into this"* (MoS: 2015, Semi-structured Interview).

The MoS also has to build and maintain the cane access roads. I was informed that it was their priority to ensure that wherever sugarcane was grown, the roads in those areas should be up to standard for the transport of canes to the mills. They also informed me that over the three years (2012-2015), the Government was at times not able to get the road works started before the crushing season because they could not find contractors who were capable of delivering the service.

9.5.4 Farmer Attitudes Toward Mechanization

Even the sugarcane farmers on flat land are not very interested in adopting new technologies. They are happy at present with the use of bullocks and their existing machinery, and are concerned about the cost of new machines. Farmers on undulating-hilly terrains who currently use only bullocks would like to have labour-saving machinery, but it would have to be suited to use on hilly terrains. They also have a number of concerns about the cost of fuel and maintenance. As one of the Lautoka farmer's grandson told me, a second-hand tyre for a tractor costs around FJ$1000 whilst some of the farmers in Tavua-Rakiraki stated that *"Yaha pe to khana kharide ke paisa nahi hai…tractor kaha se kharide ga"* [It is difficult to buy proper food…how can we even afford to buy a tractor] (Tavua Farmer: 2015).

Other worries were the accessibility of the equipment for farmers and gangs, and the terms for using them. Even if a 'machinery pool' system was created, there remained gang politics whereby smaller and poor farmers within a gang are neglected, and the first choice is given to farmers who have more power (refer Section 8.4.5.3). On different occasions, farmers have demonstrated their dismay at the milling staff who favor those farmers who bring in sugarcane that have been harvested mechanically. The FSCs position is that because the mechanically harvested canes are billeted[43] they have to be given priority, as since they arrive at the mills in small pieces and have a larger surface area exposed, their quality may

[43] Common name for chopped lengths of cane (approximately 300mm) produced by mechanical cane harvesters.

be affected by any delay. Interestingly, the billeted canes are mostly brought in by farmers who are not smallholders but by farmers who are well off, in which case the priority given to mechanically harvested cane prolongs the time that poorer smallholder farmers have to wait at the mill before they can dump their canes and return to their farms. As a result, the quality of the smallholders' cane is adversely affected.

Additionally, while the mechanized harvesting machines can increase the efficiency of harvesting, they also have their limitations. Farmers informed me that:

> "The advantage of using a harvester is that it costs less and also takes less time to harvest. But, it damages the crop, and decreases the productivity" (Lautoka Farmer: 2015).

> "Mechanization ke liye machines ayi kaha se.....hum logon ke paas to paisa hai hi nai.....Fiji may to kisaan ke paas 10-12 acre farm hai...chota area may...pahile yaha pe machine katis hai....saath saal pahile kaat ke gais raha...aaj tak u khet me ganna nai bhe...machine ke to blade hath ke barabar zameen ke bhitar sab kuch kharaab kar dewe hai....kuthi pe to tractor chal jawe hai...machine chal jawe hai...kahis ke chota run hai na....aur lorry sathe bhi dhauri...pata nai kitna baar ek dhari pe u chalet hai.....aur dusar baat e hai tum janit ke jon ganna logon idhar bowaye hai…e ganna logon ke jarh thora kamjor hai". [Where are we going to buy the machines from to mechanize our farms? We don't have money...farmers have 10-12 acres of farms in Fiji…we have had machines harvesting here previously…harvested 7 years back...till date the cane is not able to grow in that field…the blade of the machine is almost the length of the hand, it spoils everything that is inside the soil, the machine needs the truck to run parallel to load the billeted canes at the same time, we don't know how many times both the machine and the truck run on the same rows of cane…and secondly the cane that we plant here has weak root systems already] (Ba Farmer: 2015).

One evening while travelling in a bus along the Lovu Cane Sector Highway in Lautoka the bus went past one of the farms, and a group of passengers started talking about the mechanized harvester. They said that one of the main

disadvantages of the mechanical harvester is that it is not able to harvest all the produce, specifically on the *dharis* (rows of canes along the edges of the farm) as illustrated below (refer Figure 9.20). I heard them say that the farmer would incur a loss of around 7-10 tonnes of canes.

Figure 9.20: Cane left standing after mechanical harvest
Source: Author

One farmer from Lautoka-Ba region seemed to sum up the general feeling about mechanization:

> "It has been tried, machines have been brought about, but they breakdown in the process of utilization and further to this machines cannot be bought new, they are bought second hand and burn in the fields. It has also been found to damage the farms. If there is a farm side by side, you farm and do a manual harvest, and the other mechanized for one season, and measure the growth and production of the sugarcane, one will notice that there is a decline of at least 10 percent in the mechanized field compared to the field which is harvested manually. And if one continues with this, every year the productivity which one wants to achieve through harvesting of the field will, in reality, continue to decrease" (Focus Group Discussion: 2015, Lautoka-Ba Region).

9.6 Chapter Summary

This chapter has dealt with the various solutions – intensification, diversification, and mechanization – that are currently being implemented as part of a national-level industry reform plan to overcome the problems facing the sugar industry in Fiji. It describes the views of key institutional stakeholders and the responses of sugarcane farmers to these proposed solutions.

Farmer responses indicate that many of the decisions have been made without their inclusion in the decision-making process. They feel ignored and discouraged by the lack of consultation by the other industry stakeholders, and threatened by the sense that they are being forced to adopt modern methods of cane farming that will disturb the agroecology of their farms, leading to further erosion of their traditional farming knowledge. The next chapter continues this focus on proposed industry changes by analysing the institutional reforms proposed under the Sugar Cane Industry Reform Bill (2016) and Sugar Cane Industry Action Plan 2013-2022. It assesses them in terms of how well they address the problems of farmer representation, sustainability, motivation, productivity, and communication in the sugar industry.

Chapter 10 Industry Restructuring and Reform

10.1 Introduction

Over the past 15 years, there has been no shortage of proposals for reforming and restructuring the Fijian sugar industry, all driven by the structural dynamics that have been having a negative impact on the future of the industry. Since 2002, various Governmental initiatives such as 'The Pacific Island Countries Trade Agreement (PICTA)' ratified in 2002 (Andersson and Jenshagen: 2010), the Government's 'Strategic Development Plan (2003-2005)' (Government of Fiji: 2002), the 'National Adaptation Strategy for the Fiji Sugar Industry' in 2006 (FSC: 2007), and the 2008 'Economic Analysis of the Sugar Industry in Fiji' (FSC: 2007), plus the various earlier strategies produced by the FSC, have all proved inadequate to the task of ensuring industry survival. The latest proposals for institutional restructuring and reform come in the form of the Sugar Cane Industry Reform Bill (2016) and the Sugar Cane Industry Action Plan (SAP) 2013-2022. Before considering the impact of these latest proposals on the situation of the sugarcane growers, a description of the institutional structure of the sugar industry in Fiji as it exists today will be given.

10.2 Part One: Current Sugar Industry Institutions

For ease of presentation, the different organizations and institutions making up the sugar industry will be divided into the following broad stakeholder categories: State Institutions, Grower Institutions, Land Owner Institutions, and Customer Organizations.

10.2.1 State Institutions

10.2.1.1 Ministry of Sugar (MoS) - Government of Fiji

The Ministry of Sugar (MoS) of the Government of Fiji is responsible for coordinating the activities and functions of the various institutions that make up the sugarcane industry, for the planning, organizing, implementing and evaluation of various policies and programs that aim at boosting sugarcane production, and ensuring the timely, effective and efficient delivery of services to relevant actors

for a ‘global, sustainable, vibrant, viable and competitive sugar industry’ (Ministry of Sugar: 2015b). For details of the strategic priorities of the MoS, refer (Ministry of Sugar: 2015a).

Since 2006, the Bainimarama-government has been involved in restructuring and reorganizing the sugar industry and decision-making in the sugar industry has become centralized within the MoS. The MoS is now responsible for the successful facilitation and implementation of the sugarcane industry restructuring as set out in the Sugar Industry Strategic Action Plan 2013-2017 that was put together by key industry actors including the Government in 2012 (The Sugar Industry Stakeholder Action Group: 2012). The action plan builds on the Deloitte Report of 2011 and focuses on six key areas: (i) Crop Production and Grower Advisory Services; (ii) Harvesting and Transport; (iii) Milling and Processing; (iv) Cane Quality Payment; (v) Revenue Generation; and (vi) Industry Structure.

10.2.1.2 Fiji Sugar Corporation (FSC)

The FSC was incorporated by an Act of Parliament in 1972 as the successor to the South Pacific Sugar Mills Limited (SPSM) and Colonial Sugar Refinery Limited (CSR). The FSC is the largest public enterprise in the country and the monopolistic miller. It has four sugar mills; three of them situated on Viti Levu and one on Vanua Levu. The four mills are: (i) The Rarawai Mill on the bank of the Ba River (founded in 1886); (ii) The Labasa Mill on Vanua Levu (founded in1894); (iii) The Lautoka Mill, the largest mill, which commenced crushing at Lautoka in 1903; and (iv) The Penang Mill, founded in Rakiraki in 1881 by the Wilmer brothers, and acquired by CSR in 1926. Each mill services a number of ‘sectors’. The Lautoka mill has 14 sectors (refer Section 6.7.1) under its operations whilst the Rarawai and Labasa mills have 10 sectors each. The Penang Mill used to cater for three sectors until its demolition in 2017, due to irreparable damages sustained during Cyclone Winston in 2016. For Sector names, refer (SRIF: 2010).

The Corporation is responsible for the manufacture and sale of raw sugar, and molasses as a by-product of sugar. It owns and maintains some 720km of railway track for the transportation of sugarcane to the mills and is engaged in developmental and project works through its subsidiaries and related companies, the FSC Project Ltd and Pacific Cogeneration Ltd.

After the repeal of Fiji Sugar Corporation Limited Act 2005, the FSC is now governed under the Companies Act. At present, of the 43,267,016 fully paid shares, the Government owns 30,239,160 shares. The rest are owned by statutory bodies, local public companies and individuals (FSC: 2014). This makes the Government the majority shareholder (69.8 percent) in the Corporation, giving it the power to make all decisions. The Corporation's shares are listed and traded on the South Pacific Stock Exchange Limited.

10.2.1.3 Sugar Industry Tribunal (SIT)

The SIT was established by the Government to give farmers more say in industry decision-making (Sugar Industry Tribunal: 1989). Like other institutions, it was introduced through the Sugar Industry Act of 1984. The SIT deals with the contractual relations between the growers and the FSC, and any disputes and differences within the industry is resolved through the Master Award that came into effect on 23 November 1989, replacing the earlier cane contracts.

10.2.1.4 Sugar Research Institute of Fiji (SRIF)

The SRIF was established for promoting, by means of research and investigation, the technical advancement, efficiency, and productivity of sugar industry. It is the scientific research branch of the sugar industry in Fiji (SRIF: 2010) and is responsible for the development and dissemination of technology and information for increasing productivity, profitability and the sustainability of the Fijian sugar industry.

The SRIF works on the philosophy that the future of the industry is profoundly dependent on the introduction of new high yielding and disease-free cane varieties that will enable the industry to become more productive and simultaneously improve the livelihood of farmers. It signed four contracts with the EU between 2007 and 2013 totalling a little less than FJ$11.5 million in support of moving their main office, and building two regional field station for training of staff locally and overseas in new research techniques, for conducting various farm experiments and disseminating advisory services for intercropping, seed cane planting, and pest, weed and fertilizer management (Delegation of the European Union for the Pacific: 2013).

SRIF also engages a Science Audit Committee to monitor and review the quality and output of any research carried out by the Institute, including preparation of reports and recommendations.

10.2.1.5 Ministry of Agriculture (MoA) - Government of Fiji

The aim of the MoA is to provide customer focused and market driven agriculture in the country. It does this by promoting agricultural activities to reduce poverty and the risks of food insecurity, and the export of major agricultural products, such as copra, seafood, root crops and vegetables originating from the rural sectors of Fiji, such as the cane belts, to contribute to the GDP of the country (Ministry of Agriculture: 2016).

The MoA's role in the sugar industry is to assist farmers with advice and skills for diversification into agricultural commodities on the cane fields leased for sugarcane farming purposes. The MoA and the MoS work together in the formulation of some of the agricultural policies that are thought to benefit the smallholder sugarcane farmers in the short to long terms.

10.2.2 Grower Institutions

10.2.2.1 Cane Producer Associations (CPAs)

The CPAs are responsible for preserving and safeguarding the welfare of the cane growers in their milling areas (LCPA: 2011; 2012; 2014). They help cane farmer gangs and their members to develop their potential to decide on their future through capacity building and adopting the best agricultural practices. The associations also facilitate fairer trading conditions for its members, alleviating poverty and strengthening producer's positions in agriculture.

There are currently three CPAs in the country. They are known as the Labasa, Lautoka, and Rarawai & Penang Cane Producers Associations. The Labasa CPA looks after the interests of the cane growers in the Labasa milling area, the Lautoka CPA looks after the interests of the growers in the Lautoka milling area, and the Rarawai & Penang CPA looks after the interests of the growers in the Rarawai and Penang milling areas. The three CPAs have received incomes from FT Premiums equivalent to approximately FJ$22 million for sugar sold on the FT markets for the period 2010-2014 (Taleitaki: 2014).

10.2.2.2 Sugar Cane Growers Council (SCGC)

The SCGC was established under the Sugar Industry Act of 1984 to represent the interest of all cane growers in Fiji. Its primary role is to protect and further the interests of all registered sugarcane farmers in the industry. Its main aim is to provide representation, leadership and services to the cane growers so that they are able to secure long-term viability in an industry in which they are the largest stakeholders (SCGC: 2016).

A wide range of services is provided by the Council that over the years have helped growers save thousands of dollars. The number and types of services offered by the Council have increased since its inception, as has the number of growers benefiting from them. Some key services provided by Council are: preparation of income tax return for growers; registration of grower and preparation of VAT returns, Memorandum of Gang Agreement (MOGA) (refer Section 6.7.2) records, references and reviews; rent appeal with *iTLTB* and Lands Departments; responding and liaising with relevant authorities regarding land rent disputes; providing harvesting agreements between growers and substitutes and resolving disputes arising from harvesting agreements; working with FSC and District Officers, Commissioner[44] Western and Northern and MoS for maintenance of cane access roads; looking into gang matters, gang disputes, gang rationalizations and gang meetings; transfer of grower registrations and split registrations, lorry wheel tax, burnt cane, farm drainage, sale of weedicides, crop damage (SCGC: 2015, Semi-structured Interview).

The Council's legal department, which was established on 3rd February 2003, has continued to provide a wide range of legal services to the growers at an affordable cost. It was the aim of the Council to operate the legal services on a user pays basis to avoid any additional burden on other growers, but in August 2011, all legal services ceased due to legislation that prevented the Council from providing legal services without a practitioner's certificate. A number of representations were made

[44] These are individuals appointed by the Ministry of Rural & Maritime Development. Their role in the SCGC is to strengthen its position in coordinating and facilitating rural and maritime development and also managing disasters.

to the Chief Registrar, but the council was not allowed to continue unless a legal firm was engaged to act on its behalf (SCGC: 2012).

10.2.2.3 Sugar Cane Growers Fund (SCGF)

The SCGF was established by Act No. 9 of the Parliament of Fiji in 1984 (SCGF: 2009) as the successor to the earlier Cane Price Support Fund and the Stabilization Fund. The Fund provides loans to cane growers for the following purposes: (a) increasing production of cane; (b) improving efficiency in planting, growing, harvesting and transportation of sugarcane; (c) work necessary or desirable to rehabilitate farms, buildings and other installations damaged, destroyed or affected by floods, cyclones, droughts or other natural disasters; (d) work necessary or desirable to establish sugarcane farms and to construct buildings and other installations on those farms; (e) work necessary for diversification; (f) for personal family needs of growers during periods of financial distress or hardship; and (g) enabling cane growers to participate in commercial ventures which are intended to benefit the cane growing industry.

On different occasions, the fund has loaned money to the South Pacific Fertilizer Limited (SPFL) to support the price of fertiliser supplied to the sugarcane growers. It has provided FJ$3 million towards the establishment of an accelerated Cane Development Revolving Fund initiated by the FSC, from which farmers can take interest free loans for replanting cane on existing cane land, or on land that used to be under cane but had gone idle over years (Bolatiki: 2012). It has also assisted with the special cane payments made by the Government to assist sugarcane farmers as part of the *Tropical Cyclone Winston* Relief Payment allocated in the 2017-2018 National Budget (DEPTFO News: 2018).

The Fund has also provided assistance during emergencies, such as FJ$7,786,871 in 1998 during the prolonged droughts of 1995-1997. It has supported the cane rehabilitation scheme (a scheme to rehabilitate farmers who were affected by the drought by providing them with sugarcane seedling and assistance with planting) following a joint submission made by the SCGC and the FSC. It has also provided a supplement of FJ$19 million towards the FJ$42.7 million for different industrial projects being implemented in the sugar industry, with the rest covered by the Government till 2000 (SCGF: 2011). Further to this, the Fund has contributed to

the accelerated cane re-planting program (a program for accelerating the planting of sugarcane) under the EU funding. The EU provided 62 percent of the total costs while the growers had to borrow from the Fund to cover the remaining 38 percent.

Presently, the Fund has been providing monetary assistance to cane growers in the form of: (a) Priority Loans: limited to FJ$5000 for purposes such as farm development, planting new cane, purchase and repair of farm equipment, house repairs, educational expenses, wedding expenses, drainage, purchase of farm equipment parts, road repairs, weedicides, borehole drilling, funeral expenses and group medical and life insurance cover; (b) Specialised lending: Loans of up to FJ$50,000 for the purchase of farms, farm machinery, sugarcane trucks, medical expenses, construction of farm houses and for other purposes provided in the Act; (c) Loans to tenants for new leases: loans to assist growers in obtaining new leases from the *iTaukei* Land Trust Board, Lands Department and other Landowners; and (d) Refinance of Sugar Cane Growers Loan: loans to refinancing growers loans with commercial banks and other lenders. The loans are approved only for the purposes provided in the Sugar Cane Growers Fund Act (SCGF: 2015).

10.2.2.4 South Pacific Fertilizers Limited (SPFL)

The SPFL, based in Lautoka, imports raw materials for fertiliser, and blends, packs, and distributes them to cane growers and others in the local market. It was originally jointly owned by FSC, SCGC and SCGF, but in 2009, the Government agreed to the FSC divesting from the SPFL and transferring its shares to the remaining shareholders. At present, the SCGF holds 95 percent of the shares and the SCGC the remaining 5 percent (FSC: 2016).

10.2.3 Landowner Institutions

10.2.3.1 *i*Taukei Land Trust Board (*i*TLTB)

In 1940 the Colonial Government established the Native Land Trust Board (NLTB) to handle leasing and rent arrangements for Fijian-owned land, which makes up about 83 percent of Fiji's total land. The Board deals with relations between landowners and cane farmers (*iTLTB*: 2014). The rights of both groups are protected by the Agricultural Landlord and Tenant Act (1976).

The native land in Fiji is currently managed by the *iTLTB*, previously known as the NLTB, and has been reformed and reorganised since 2006. The *iTLTB* currently administers 35,586 leases on *iTaukei* land. Of these, 14,137 are used for agricultural purposes, 1612 for commercial, 501 for educational, 392 for forestry, 455 for Government, 550 for industrial, 16,503 for residential purposes, 256 for tourism, 167 for water/mineral purposes and 1,013 for other purposes. Under their agricultural banner, the following are the activities for which tenancies may be provided: (a) Cane; (b) Root Crops; (c) Vegetable; (d) Dairy Farming; (e) Beef Farming; (f) Poultry Farming; and (g) Timber Plantation.

The two laws governing tenancies are the Agricultural Landlord Tenants Act (1976), under which a 30-year lease is granted; and the Native Land Trust Act (NLTA) which allows for a longer leasing period depending on the needs of the landowning unit – i.e. that they will not require the land for use, for performing maintenance on it, or for support during the term of the lease period (Lal: 2011; *iTLTB*: 2014).

10.2.4 Customer Organizations

10.2.4.1 European Union (EU)

Fiji is one of the founding members of the Georgetown Agreement which formally established the ACP Group (Africa, Caribbean and Pacific Group of States). Respect for human rights, fundamental freedoms and the rule of law and democratic principles are the basis for EU's relationship with Fiji. Under the EPA, the EU buys sugar from Fiji for three times the normal world market price.

In March 2016, following Fiji's return to democracy after the 2014 elections, the EU's development cooperation with Fiji, which was suspended after the military coup of 2006, was reinstated, but with different approaches. The re-instating of ties enabled Fiji to fully benefit from the 11th European Development Fund (EDF). Under the 11th EDF, an indicative amount of €28 million was allocated for Fiji for the period 2014-2020. The focal areas for the assistance were sustainable rural livelihoods, public administration reform and governance. As part of the agreements, the EU has helped in funding two key programs for growers to cope

with deleterious changes and the withdrawal of the preferential access quota that Fiji had been benefiting from up till this time.

The first was a program named 'Accompanying Measures for Sugar Protocol Countries Programme' (AMSP) implemented to support the development of the supply and marketing of a wider range of Fijian crop and livestock products. The second was the 'Improvement of Key Services to Agriculture' (IKSA) for Livestock and Livestock Products (2012 - 2016) program. Similarly, all the sugar mills in Fiji, along with the other CPAs, were later supported in securing FT Labelling Organization-Certification 'license to trade in FT products'. This significant achievement was influenced by the EU through the Annual Action Plan (2011) 'Improvement to Key Services in Agriculture project'.

10.2.4.2 FairTrade (FT)

FT is an alternative approach to conventional trade and is based on a partnership between producers and consumers. The aim of FT is to empower farmers and workers in Fiji through improved terms of trade that helps advance the working and living conditions for themselves and their communities.

Fiji is home to one of the three largest FT producer organisations in the Pacific. Since 2010, FT sugarcane producers have contributed to the development of Fiji through a variety of FT community and economic development projects (LCPA: 2011; 2012; 2014). The premiums received from the sale of FT certified sugar are not directly handed to the growers but are applied to certain projects of which some are: (a) replanting of cane fields; (b) repairing cane field drainage systems and subsidising fertiliser costs; (c) supply of harvesting equipment and first aid kits; (d) death benefit funds for members' families; (e) assistance for education, water and electricity projects; and (f) sanitary and public infrastructure upgrades.

The FT initiative was initially proposed from within the sugar industry and was supported by the Bainimarama Government in July 2008; giving the FSC and the SCGC approval to facilitate the accreditation of Fiji sugar as FT certified. The certification started with the FSC Labasa Mill and the Labasa Cane Farmers. As a result, Labasa Cane Producers Association in 2011 became the first cane producer

association in Fiji to bring FT into the country in order to provide stability for the sugar producers in an otherwise unpredictable commodity market.

All other sugar producer associations have since formed close relationships, and are now all certified with the FT, something which is highly supported by the Government of Fiji. Under FT, growers who are members of the three Cane Producer Associations (CPAs) receive an additional US$60 per tonne of sugar sold. This income does not go directly to the individual farmers but is channeled to the CPAs respective bank accounts. Fiji became the largest single FT premium earner from the sale of FT sugar in the world by early 2014. This resulted from the FT coordination unit's effective support for an FT certified sugar quota for 70,000 tonnes, with a total premium entitlement of US$4.2 million annually, destined for Tate & Lyle Sugars, UK.

10.3 Part Two: Restructuring and Reforms

Since 2006, the Fiji Government has been involved in restructuring and reorganising the sugar industry with the effect that industry decision-making has now become centralised within the Government (MoS). This has seen changes in the process of industry operations, shifts of powers, and modifications to and dis-establishment of some institutions and positions. The new restructuring will see the sugar industry headed by the MoS, which will be charged with the administrative oversight of the whole industry. The primary role of the MoS will be to create and maintain an encouraging environment to ensure that all stakeholders contribute to achieving the Government's and the Industry's overall objective of a thriving sugarcane industry (MoS: 2015a).

Notwithstanding this intention, the sugarcane growers continue to show little confidence in the future of the industry.

> "Nothing has changed, and nothing will change. We are always placed in the dark. The Deloitte Report would be somewhere collecting dust. Anyways, we were not consulted when this change was taking place, only a few attended……and we don't know if their voices will be heard…who will listen to uneducated, poor farmers like us and listen to what we have

to say…does our say even make a difference, they will just do what they want to do…" (Labasa Farmer: 2015).

The Fiji Times (Rawalai: 2016) reported on a visit made by the Prime Minister to the North of Fiji where the farmers informed him that they have become slaves in the sugar industry. Growers in Seaqaqa cane belt felt that, as major stakeholders in the industry, they have very little say in its operations.

> "A cane grower, Mr Hussein, said that farmers continued to be told what to do, adding that their contribution to the industry was never recognized. It is a disappointment to see that they (farmers) do not have a say in policy changes of the sugar industry. Take for example the latest Sugar Cane Industry Reform Bill (2016) where farmers did not have a say in the making of the Bill. We are like slaves. We are told what to do. We feel that our rights as a major stakeholder are never taken seriously by the industry. Mr Hussein also stated that farmers were not consulted about the changes in the price of cane payment. What we need is recognition of our contribution and this can only be done if we have a say in the changes that happen in the industry".

The lack of confidence and motivation among the farmers is having an adverse effect on the productivity level of the entire sugar industry. They have their root in a number of problems that may be summarized as problems of 'representation', 'sustainability', 'motivation', 'productivity' and 'communication'. The latest proposals for institutional reform aimed at reinvigorating the industry are contained in the Sugar Cane Industry Reform Bill (2016) and the Sugar Cane Industry Action Plan (SAP) 2013-2022. These are discussed below with a view to how effectively they address these problems.

10.3.1 The Sugar Cane Industry Reform Bill (2016) and the Problem of Representation

The Sugar Cane Industry Bill seeks to repeal the Sugar Industry Act of 1984. The main objectives of the Bill are to:

1. Establish the [Sugar Industry] Tribunal, the [Sugar Cane Growers'] Council and the Mill Area Committees;

2. Promote the efficiency and development of the Industry by streamlining the Industry's operational processes;
3. Coordinate the activities of all sections of the Industry and promote goodwill and harmony between such sections;
4. Prescribe standard provisions governing the mutual rights and obligations of the Corporation and the registered growers;
5. Provide for the keeping of an official Register of Growers;
6. Encourage and provide the means for conciliation with the view of preventing and settling all disputes within the Industry by amicable agreement;
7. Provide the means for preventing and settling disputes within the Industry; and
8. Convert all current Government loans to the Corporation and the related accrued interests into equity and for the Government to acquire all remaining shares of the Corporation, upon or as soon as practicable after the commencement of this Act.

Of most importance to the current discussion are the proposals for restructuring the Sugar Cane Growers Council (SCGC) and the Sugar Industry Tribunal (SIT).

10.3.2 Restructuring the Sugar Cane Growers Council (SCGC)

Section 17 of the Sugar Cane Industry Reform Bill states that the SCGC shall take all necessary steps to protect and develop the industry and the interests of the registered growers by, in particular:

1. Encouraging and promoting cooperation among the registered growers, and between registered growers and others engaged in the industry;
2. Removing or providing redress of all legitimate grievances of a registered grower in any particular sector, district or mill area;
3. Providing registered growers with goods and services relating to the business of cane growing;
4. Establishing, holding and administering funds for the benefit of registered growers;

5. Encouraging and promoting research and education with a view to improving the efficiency and productivity of registered growers and to collect, record and distribute information of value to registered growers, and
6. Performing such other functions as may be assigned to the Council by the new Bill or any other written law. But, this should be for the benefit of the growers and the industry in general.

It should be noted that growers are the major stakeholders in SCGC, and pay a levy for its operation. This is confirmed in the Sugar Cane Industry Reform Bill (2016) now before the country where Section 25 of the Bill allows the Council, following the approval of the Minister, to impose upon each registered grower a special levy from time to time to meet the cost of any capital project for any other special purpose, and Section 26 (1) of the Bill says that any special levy imposed under Section 25 must be deducted according to the registered grower's share or proceeds of the sale of sugar, molasses and other by-products of cane, and must be collected by the Council from the Corporation upon the production of a certificate of authorization for such deduction by the Accountant (Government of Fiji: 2016).

As described in Part One, the SCGC was established to represent the cane growers, to protect and further their interests, and provide them with leadership and services. As the principal institution established to represent the interests of cane growers in Fiji, the growers would like to be able to elect SCGC board members who fully understand their issues and who are capable of solving their problems effectively and efficiently. In 2009, however, the Government, thinking that the SCGC was becoming too political, removed its elected board of councillors and replaced them with an Acting Chief Executive Officer. In the Sugar Cane Industry Reform Bill, the positions of the councillors have been replaced by nine appointed councillors consisting of the Commissioner Northern and Commissioner Western, two representatives each from the Penang, Labasa and Lautoka CPAs, and a representative from MoS (Mala: 2017). In the words of Professor Biman Prasad:

> The Prime Minister is not doing any favour to growers by increasing the size of his appointed council to include one representative from each of the eight cane growing districts. They will not be elected but also appointed. This is making the SCGC a toothless tiger. Currently, the undemocratic council comprises nine appointees including six from the three cane producer associations (Labasa, Lautoka and Rarawai & Penang), two divisional commissioners (North and West) and a representative of the Sugar Ministry. The chairman is also appointed by the sugar minister who is the Prime Minister. The new proposed SCGC will, therefore, have a total of 17 members. They will all be beholden to the Prime Minister because they are his appointees. Even if the six cane producers' representatives disagree with any proposal, they will be outnumbered and outvoted. Therefore, it will be easy to change the Master Award (the principle governing legislative instrument for the industry), the key instrument. The Prime Minister says the Master Award can only be changed if both the council and FSC agree to the changes. That will not be hard because both are controlled by Government. It may well be part of FSC's strategic plan to change the current formula by which proceeds from the sale of sugar are shared 70/30 in favour of growers. FSC's plans have not been revealed. Growers are the largest stakeholders in the industry. They should work in partnership with FSC. But they have been left totally in the dark (The Fiji Times, 30th of July 2016).

Some sentiments regarding the proposed changes to the SCGC expressed by growers to the Parliamentary Standing Committee on Economic Affairs during the consultation process on the Bill in the Sigatoka cane belt were:

> "We want … representatives from each district elected by the farmers to be part of the council" (Lomawai Sector farmer) (Tikomailepanoni: 2017).

> "FT should not be involved in the council" (Lomawai Sector Farmer)[45] (Tikomailepanoni: 2017).

[45] Here the farmer is referring to FT's influence on the SCGC, the government and the sugar industry as a whole.

> "The mill area committee[46] be scrapped completely from the new Bill.....the council should inform growers about changes in the sugar industry Master Award……FT are now making the business before it was good, it was the farmers, we are getting nothing[47]…they are getting the wages and vehicles are free, we are only getting in cents now, before it was good when it got started, but now we are getting less money" (Lomawai Farmer) (Tikomailepanoni: 2017).

10.3.3 Changes to the Sugar Industry Tribunal (SIT)

The Part 2 (Sections 4-13) of the Sugar Cane Industry Reform Bill re-establishes the Sugar Industry Tribunal (SIT), but with major changes. These will see the SIT functions being absorbed by the MoS (Logavatu and Lyall: 2016), giving the Minister of Sugar the power to amend the Master Award following consultations with the SCGC and the FSC. Previously, this power was vested solely in the SIT. There are also changes to the manner in which disputes between the miller and the growers will now be settled. They will now be settled by the Permanent Secretary of MoS (Mala: 2017) rather than the SIT.

The SIT will be chaired by the Director of Sugar located in the MoS, a position that was previously held by the Industrial Commissioner of the Tribunal. Under the Bill, the positions of Industrial Commissioner and Registrar of the Tribunal will be disbanded and replaced by one person who shall be appointed by the Chief Justice.

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[46] A Mill Area Committee must consist of— (a) the Director for Sugar who must be the chairperson; (b) 3 members appointed by the Council to represent the Council; and (c) 3 members appointed by the chief executive officer of the Corporation to represent the Corporation. The functions of a Mill Area Committee shall be to encourage and promote good relations between persons engaged within the mill area of the Committee in the cultivation and harvesting of cane, the transportation of cane to the mill in that area, the crushing of cane, the making of sugar at that mill and the transportation and storage of sugar made at that mill, and in particular to— (a) assist in removing and providing redress for all legitimate grievances within that area relating to any of the matters referred to in the foregoing provisions of this Part; (b) secure the maximum production of cane and sugar in that area within the limits of the mill quota of cane and sugar for that mill; (c) advise the Minister, of all matters referred to it by the Corporation or the Council as the case may be; (d) assist within that area in the collection, recording and distribution of information in respect of the Industry; and (e) perform such other functions as may be assigned to it under this Act.

[47] What the farmer is referring to is that when FT was established, there were lots of benefits for the growers, but over time FT has established itself as a business entity and is now making money out of FT certification.

Such person shall be qualified as a Judge of the High Court or have extensive experience in Economic or Industrial Relations. This has raised a concern that such a person would arbitrate and pass judgements from an economic perspective alone, without taking into account the social aspects, thereby contradicting the intentions of the Sugar Cane Industry Action Plan 2013-2022 which *'assumes that the sugarcane industry continues to be viewed by the Government as a fundamental part of the social and economic'* development of Fiji.

There were also changes proposed in the system of registering sugarcane growers. Section 43 of the Bill entitled a person to be registered as a grower in respect of any farm upon meeting the criteria set out by the Corporation and approved by the Permanent Secretary. Previously growers were registered with the Tribunal. This was now to be shifted to the FSC. Following objection from farmers, however, this provision has been removed from the Bill. Also under consideration is the removal of the Commissioner Northern and Western from the council board (Chaudhary: 2017).

Some sentiments regarding changes to the SIT shared by growers with the Parliamentary Standing Committee on Economic Affairs during the consultation process on the Bill in the Sigatoka cane belt were as follows:

> "…we want the sugar tribunal to remain as it always was, and totally independent and nothing to do with FSC or the MoS" (Lomawai Sector farmer) (Tikomailepanoni: 2017).
>
> "As a farmer I am not sure who is a tribunal at the moment, if we are trying to make this industry more efficient than (sic) I am with it……how can the miller be transparent and impartial in making decisions in terms of the Master Award…FSC is the miller and is there to make sugar" (Tuvu Farmer) (Tikomailepanoni: 2017).
>
> "Any change [to the Master Award] must be done by the SIT and not by the Sugar Minister as this Bill proposes……the Sugar Minister be also someone who knows the industry from ground up" (Malomalo Farmer) (Chaudhary: 2017).

Similar, though more general, sentiments were expressed in Tavua cane belt during the first round of consultations in 2016.

> "Government has no respect for cane growers because it formulated two Bills[48] concerning the sugar industry without any input from farmers……farmers need real assistance in terms of drainage, irrigation and improved field services…instead of wasting tax payers money holding consultations in two Bills that we did not participate in, they should have held consultations on what our needs are……we are trying to repair our homes, our labourer's home and prepare for harvesting with no assistance from the government……these are the types of things that are important to us and not Bills that will give total control of the industry to the FSC" (prominent farmer and spokesman for Yaladro group) (Chaudhary: 2016).

10.3.4 Changes to the Sugar Research Institute of Fiji (SRIF)

The Bill provides for the disestablishment of the SRIF and the shifting of its core function to the FSC. It is envisaged that the SRIF will no longer be an independent body in the future, and will be controlled by the FSC. This means that the FSC will be able to dictate the development of what cane varieties it wants sown. Farmers, however, have reported that many of these new varieties are not suited to the environmental conditions and do not grow well compared to traditional varieties (refer Section 9.3.4.1). The transfer of the SRIF functions to the FSC is likely to make farmer resistance to new cane varieties more difficult.

10.3.5 ***Amendments to the Master Award***

The Master Award is the principal legislative instrument for governing the sugar industry. It was established by the Sugar Industry Act of 1984, and prescribes the rights and obligations of growers and FSC in relation to: (a) planting, cultivation and harvesting of cane by sugarcane growers, (b) sale and delivery of cane by growers to FSC, (c) acceptance and purchase of cane by FSC, and (d) the manufacture, storage, marketing, delivery, and sale of sugar, molasses, and other

[48] The farmer is referring to the Sugar Cane Industry Reform Bill and the SAP, although the SAP is not a Bill, it is just a plan.

by-products made from cane by FSC (Prasad and Tisdell: 2006). The Award also sets out the formula according to which the division of proceeds from production of sugar is divided between the growers and the miller. According to this formula, the growers receive 70 percent of the proceeds for production up to 325,000 tonnes, 72.5 percent for production between 325,000 to 350,000 tonnes, and 75 percent for every tonne produced in excess of 350,000 tonnes.

As the Bill seeks to repeal the Sugar Industry Act of 1984, it may also see major amendments being made to the Master Award. Section 35 of the Bill states that the Master Award shall continue to govern the sugar industry until it is revoked by the Minister for Sugar, but under Section 36 of the Bill, the Minister for Sugar has the power to make amendments to the Master Award following consultation with the SCGC and the FSC. The SCGC, however, is now, as we saw above, an unrepresentative, government-controlled institution, leaving the cane growers with very little say on the issue.

Provision 4.15a[49] of the Master Award states that the Corporation shall *not* be liable for any loss resulting from any stoppages at a mill due to accident or any other cause outside the control of the corporation. In the past, this provision has affected the growers negatively. As discussed in previous chapters, the majority of people losing out from these stoppages are the growers who have to reorganise and re-plan their activities, and incur additional expenses. Not at any point has the FSC been held accountable for such occurrences. Now in the new Bill any action taken by any registered grower because of a dispute that results in a stoppage will be subject to a fine. In the view of The National Federation Party (NFP) (a political party):

> ……the new Bill criminalises sugarcane production. The growers are now threatened with fines as fixed penalties of up to $500 for the schedule of offences growers commit. Therefore, if they refuse to pay the fixed penalties, they can be fined up to $5,000 or imprisoned for 12 months, or

[49] The Corporation shall likewise, not be liable should urgent necessity involve a sudden alteration to the daily delivery quota of cane the Corporation is required to accept, provided that the Corporation, on the happening of any event, takes all reasonable steps to minimise such loss by forthwith notifying gangs or growers then harvesting cane, or about to commence harvesting cane for that mill, of such stoppage, cessation of crushing or variation of daily quota.

> both. Also, a grower commits an offence if he/she delays harvesting or refuses to plant cane unless he/she gives a 7-day notice to the Permanent Secretary for Sugar…… (Dass: 2016).

What this means is that, if, due to continuous milling inefficiencies, a grower decides to stop harvesting, it is an offence. The NFP advocates for growers to be able to delay harvesting if there is a stoppage at the mill, and for the case to be referred to the permanent secretary of the MoS for settling within 14 days. Despite the FSC having 5-6 months to maintain their cane processing machinery every year between crushing seasons, there are no penalties for FSC for any of its failures or negligence. This illustrates the uneven contest between the FSC and the growers.

For the farmers, this is nothing new, but a continuation of the situation that existed during the colonial and CSR days as discussed in Chapter Five.

> During all these years the costs of the millers have been recovered, they have received a considerable contribution to their capital improvement and, in addition, they have a good reward. They have not gone shortly. But the growers have. In settling the terms of the new contract, I have tried to restore the balance. I have tried to give the growers the reasonable remuneration which the Commonwealth Sugar Agreement intended that they should have. I hope this will not deter the millers from continuing their good work for Fiji and for the Sugar Industry in Fiji [Lord Denning].

Added to this is the problem that the growers are never provided with enough information relating to the industry, and are obliged to accept changes that are made to the sugar legislation without being able to question its legitimacy, just as they are used to accepting the 'certified proceeds and costs'[50] without scrutiny as to its accuracy and credibility.

[50] Documents provided to the growers with descriptions of harvests, costs and production.

10.3.6 The Sugar Cane Industry Action Plan (SAP) 2013-2022

10.3.6.1 The Problem of Sustainability

The focus of the SAP is on the sugar sector's commercial viability, industry competitiveness and sustainability. Its objective is to strengthen the level of integration and alignment across the entire value chain by setting out industry agreement on priorities and actions for the industry's recovery and growth. The options outlined in the SAP for improving the industries commercial viability, competitiveness and sustainability include the privatization of the industry by:

(a) Establishing the four mills as separate businesses with growers, landowners and mill workers in each mill area participating as shareholders;

(b) Establishing capital investment projects as separate standalone businesses that are 'decoupled' from the Government-owned FSC;

(c) Purchasing of lease land by the FSC to establish direct control over the supply of sugarcane and reduce industry dependence on smaller, unviable production units; and

(d) Introducing mill gate or farm gate purchase of sugarcane from growers and eventual abandonment of the Master Award.

The growers have not been widely consulted on these issues and the SAP has been criticized by cane growers and grower associations. While some aspects of the strategy will help to de-concentrate decision-making power within the industry in the MoS and FSC, Option C above, the purchase of lease land by the FSC to establish direct control over the supply of sugarcane will have the effect of further diminishing grower autonomy.

10.3.6.2 The Problem of Motivation

Agenda 13.1.C and 13.1.D of the SAP recognizes the negative demographics of sugarcane farming (namely the loss of potential young farmers from the industry through rural-urban migration and immigration) as an emerging threat to the industry, and identifies the perceived unattractiveness of sugarcane farming as a career as the major causes of this.

As a way of dealing with these negative demographics, the SAP has proposed a Demographic Working Group (DWG), to be chaired by the SIT, to devise a combined New Entrant/Education and Grower Retirement Scheme. Some key elements of this scheme are:

1. Growers at retirement age (e.g. 55) become entitled to participate in a 'Grower Retirement Scheme' that would provide them with a basic monthly income;
2. The retiring growers' land is released to the Sugar Cane Growers Fund for an interim management period which is thought to address the issue of any outstanding rent or loans;
3. The land would be immediately put in production under the best management practices and start to deliver revenue to support the farmer retirement scheme and supply quality sugarcane to the mill;
4. In parallel to the above, a 'Young Cane Farmer Development Programme' would be launched.

The above scheme is clearly aimed at moving the industry away from smallholder farming systems to large-scale production systems as proposed in the SAP Agenda 13.1.E, which states that *"the industry recognizes that small production unit size is an impediment to industry growth and commercialization and increasing the average production unit size over the lifetime of the SAP is, therefore, an overarching aim of the plan".* The ultimate aim is to acquire the land of smallholders and re-lease it as consolidated amalgamated farming plots such as those seen in Mauritius.

Such amalgamated farming units will give the FSC more powers to dictate land management and agronomic practices, as according to Agenda 13.1.D.5 of the SAP, cane-farming lands are to be placed into the hands of new entrants for production under best management practices. This does not mean, however, that the practices employed will be sustainable in nature. Rather, the agenda seems to be aimed more at eliminating the sustainable traditional agricultural practices that have been employed by the farmers over many generations.

10.3.6.3 The problem of Productivity

One of the arguments of Agenda 13.1.D.5 of the SAP for placing farms under the direct control of the FSC is that the current pool of smallholder sugarcane growers is contributing to the degradation of the agroecosystem. It is unlikely, however, that the implementation of large-scale cane farming under conventional 'best management practices' would be any less damaging. The issue is really about ensuring a continuous supply of produce for planned projects such as the co-generation of electricity and ethanol production, and at the same time meeting the demand for raw sugar on local market.

The Agenda 13.1.F of the SAP (Sugar Industry Organization and Relation - in relation to joint ventures for ethanol, electricity and sugar added-value opportunities) paves way for the involvement of third party investors in joint ventures in ethanol, electricity and other added-value production opportunities. Such third parties are likely to invest only if there is a fair promise of return on their investment. In order to ensure this, FSC would have to maintain its dominant position of power in the industry to be able to dictate developments.

Agenda 10.1.A (in relation to Machinery Inventory and Annual Maintenance Planning) requires that the best possible reliability and performance be obtained from the existing plant and machinery. This, however, is something that FSC has not yet been able to accomplish. Even though the Government received an $86 million loan from India to refurbish the mills, only 75 percent of the total refurbishment was completed by 2007. In 2008, the Government provided a loan guarantee to FSC of $25 million. This was later increased to $70 million in March 2009, and was increased further to $120 million in March 2010 (Government of Fiji: 2011). However, in 2016, Fiji One News reported that:

> The Rarawai Sugar Mill in Ba was down yet again, and as a result of this, all sugarcanes right from Sigatoka and Rakiraki could only be crushed at the Lautoka Mill. The issue did not go down well with the Lorry Drivers Association who had to clock long hours to ensure cane on the main island was crushed on time. They stated the situation was worse and that they were going through hard times of waiting 18 hours in the cue at the mills

> and that they were also concerned with the rainy season approaching very soon (Fiji One News: 2016a).

With regard to machinery, in 2108, the FSC received a grant of $FJD2.1 million from the Indian government towards mechanization of the sugar industry. The grant will be used to purchase five Tata Tipper Trucks, three sugarcane harvesters, five 4WD Mahindra tractors and forty farming implements for the growers. The FSC will deploy the equipment at pre-determined cost-effective rates via a system that will be communicated to cane farmers before the start of the 2018 crushing season. Despite the problems facing the industry, the Government and the FSC have promised that the Fijian sugar industry is there to stay and that it only requires a smarter intervention, and for all the industrial stakeholders to work hand in hand to achieve this (Fiji One News: 2016b).

It has also however required considerable monetary intervention. Since 2010, as part of the sugar industry restructure include (but are not limited to), the industry has received an allocation of $FJ1.5 million for the Committee for Better Utilization of Land set up under the MoA; an allocation of $FJ110 million in the 2011 National Budget to support FSC restructure; and $FJ4.4 million from the 2012 National Budget to co-fund the cane quality payment systems project with the SIT, to be implemented in 2013 (Chaudhary: 2014) (though it was later announced, in 2018, that this project had been shelved (Chanel: 2018) due to an inability to continue paying the growers). An allocation of $US6.4 million was by the EU for cane replanting after cyclone Winston in 2016 (Radio NZ: 2016). And as part of their commitment to rejuvenate the sugar industry, the government has allocated $FJ62.3 million for the sugar sector and the MoS in the 2018-2019 national budget (Kate: 2018). An additional $FJ15.4 million has been allocated for the continuation of sugarcane assistance for fallow land cane planting, the rehabilitation of un-economical ratoon fields, and the supply of agricultural lime fertilizer (Aglime) to improve the acidity of soils.

A search is also underway for lessons that might be learned from other sugar producing countries. In recent years, personnel from the different Fijian sugarcane industry stakeholder institutions and other actors in the industry have been part of a sugar mission team visiting other sugar producing countries and studying them in

order to learn and capture best practices that could be replicated in the Fijian sugar industry, along with the innovations in the governing structure and legislations of the industry.

10.3.6.4 The Problem of Communication

Underlying many of the problems facing the industry is the problem of communication between policy-makers and growers. Many growers lack the formal education necessary to scrutinize Government policies and make sense of how they will affect their lives on a daily basis.

> "The majority of these farmers lack formal education, and they do not understand the complexities of issues and depend on their children and grandchildren, and most importantly, their respective sector representatives and leaders for fetching in information. Any change should be a product of widespread consultation, negotiation and consensus building and must involve a win-win situation for all the parties concerned in the sugar industry and must give due recognition to the largest stakeholders of the industry who are in-fact the cane growers themselves. Additionally, a comparison of the old legislations and the new one needs to be communicated to the growers" (LCPA: 2015, Semi-structured interview).

For policy-makers to ensure that proposed changes are fully explained to growers in a language they understand, all policies concerning the growers and the sugar industry would need to be translated into the language that the farmers use daily to communicate, i.e. Fiji Bāt for the descendants of the *Girmit* farmer, and *iTaukei* for the indigenous cane farmer populations. Similarly, special agricultural jargons would need to be translated into words that the growers use in the cane fields.

> While conducting this research, I came across meetings which were held using proper or *Shudh* Hindi, as well as, to some extent, English, to convey information to the farmers. The facilitators did not seem to understand that the farmers are descendants of the *Girmit* Community, with many *iTaukei* farmers now connected to the industry, and that over the years these cane growers have developed their own ways of communicating (Diary Entry: 2015).

The reality on the ground is that the growers only understand 'farm language' as used daily in the cane fields. The farm language has become inherent to the cane farming community. Translating documents and holding meetings using a language other than used in the cane fields for relaying information is unlikely to result in any new productivity initiatives. Even though I have mixed-Indo-heritage, and have lived, trained, and been educated in India for two years and three months, I could barely understand what was being said during a meeting in Labasa once that utilized proper Hindi.

10.4 Chapter Summary

This chapter provides a description of the organizational structure of the sugar industry in Fiji, the changes taking place in its governing policy and legislature, and how these affect the problems facing the grower community. It analyses two important initiatives: The Sugar Cane Industry Bill (2016), and the Sugar Cane Industry Action Plan 2013-2022; and scrutinizes them from a grower perspective in terms of how well they address the problems of representation, sustainability, motivation, productivity, and communication. It points out that these problems are compounded at every step by the proposed restructuring and reforms.

Chapter 11 Agroecology and Indigenous Technical Knowledge

11.1 Introduction

"New approaches and technologies involving application of blended modern agricultural science and indigenous knowledge systems and spearheaded by thousands of farmers, NGOs, and some government and academic institutions are proving to enhance food security while conserving agrobiodiversity soil and water resources conservation throughout hundreds of rural communities in the developing world" (Altieri and Funes-Monzote: 2012).

This chapter draws together ideas from literature in the areas of agroecology, rural development, livelihood studies, agronomy and farmer knowledge with the findings of the present research. In order to more fully understand the depth of the problems facing the sugar industry in Fiji, it extends the scope of agroecology to include a more overtly political dimension. In discussing the problems of the industry and their proposed solutions, it focuses on the immediate concerns of the farmers for farm income, and of the FSC for increasing farm production, but argues for a more comprehensive livelihood approach that takes account socio-cultural and environmental aspects. On this basis, it explores the possibilities of building upon sugarcane grower's Indigenous Technical Knowledge (ITK), and their habits of farm experimentation, innovation and invention. The issue of the retention of the traditional farming system and the obstacles in the way of a transition toward a more agroecological form of agriculture are then discussed. Lessons on this are drawn from the example of Cuba.

11.2 Agroecology Paradigm

According to Gliessman (2007), agroecology is 'the application of ecological concepts and principles to the design and management of sustainable agroecosystems'. As a practice, it seeks to mimic ecological structures and functions in agricultural landscapes by regulating and supporting cultural services in order to achieve sustainable agriculture and livelihoods (Altieri: 1987; 1995; Altieri and Funes-Monzote: 2012).

The concept of agroecology has its roots in ecology at the farm level, but has since evolved a more holistic definition as the 'ecology of food systems, encompassing ecological, social and economic dimensions' (Francis et al: 2003, 100). This has entailed a more explicit integration of concepts and methods from the social sciences (Hecht: 1995) in order to achieve a better understanding of the unique socio-cultural aspects of agriculture. Later, the 'ecology of food systems' concept was expanded by Pimbert et al (2001: 3) to mean a system consisting not only of the farmers and farm workers who produce the food and fibre we consume, but also the massive industry that processes, packages, and distributes it. This expanded definition places agroecology, not just as a technology to be implemented at the farm level, but also as an approach for pursuing the sustainability in agriculture and the food system at the global level (Gliessman: 2007).

The concept of sustainable agriculture has evolved since the early 1980s, in response to a host of ecological and equity problems posed by the industrial system of agriculture. By employing a systems approach, it aims to minimize an array of environmental and social problems associated with the practices of industrial agriculture (Ikerd: 1992). In the developing world, sustainable agricultural practices based on application of agroecological principles and bottom-up participatory approaches have been increasingly adopted and disseminated by local NGOs in order to empower small-scale farmers for overcoming the social and environmental damage caused to rural life by Structural Adjustment Programs (Altieri: 2002).

Proponents of agroecology have argued that the issues of poverty, inequality, waste, environmental pollution, over-consumption and undemocratic governance associated with industrial agricultural and the global food system are to blame for the vulnerability, shocks, and stresses suffered by smallholder farmers (Pretty et al: 2003; Pretty: 2003; 2009). In response, agroecology advocates for greater farmer autonomy, based on local renewable resources and minimal dependence on external inputs such as synthetic fertilizers and pesticides, commercial seeds, and machinery, etc. and calls for the valorization of farmer knowledge, priorities and cultural capital.

Various official reports, such as IAASTD (2009) and FAO (2013; 2002), and international bodies such as United Nations Environmental Program (UNEP) and Biodiversity International (FAO: 2011) have argued that in order to secure food security in low income areas, we need to support small farmers and diverse sustainable agroecological approaches to farming aimed at strengthening local food economies. Studies in Cuba, India, Mexico and other countries demonstrate that agroecological methods are more environmentally sustainable and more efficient in boosting food production than those that use synthetic fertilizers, chemical and pesticides. Olivier De Schutter, UN Special Rapporteur on the Rights to Food from 2008-2014, states that small-scale farmers have the potential to double their output of food production within 10 years in critical regions by using agroecological methods (De Schutter: 2008), and he calls for a fundamental shift towards agroecology as a way of boosting production and improving the living standards. The IAASTD argues for investment in scientific, local and traditional conservation practices; the development and use of local and traditional plants, animals and other useful biological materials using advanced techniques, as well as the sophisticated application of participatory and collaborative research approaches to alleviate smallholder vulnerabilities, shocks and stresses (IAASTD: 2009).

More recently the field of 'political agroecology' has emerged with strong connections to politically engaged action research into the power differences (Hecht: 1995; Holt-Gimenez and Altieri: 2013) in local and extra-local contexts (Altieri: 2002). It considers agriculture and food production as inherently political, and calls for the foregrounding of power relations (Gonzalez de Molina: 2013). It is concerned with broader food systems, especially industrial food systems dominated by large corporations, market ideologies and governments (Bellamy and Antonio: 2017), and draws attention to class and gender relations which produce uneven access to natural resources and results in cultural and ecological degradation (Peet and Watts: 2004). Mendez et al (2013) and Gonzalez de Molina (2013) write that the aim of political agroecology is to increase farmers' control over aspects of food production through the valorization of their local knowledge and farm experimentation as means toward improving their livelihood standards and ecological outcomes.

By giving voice to those who have traditionally been excluded, political agroecology tries to improve their access to resources and make research more attuned to the livelihood needs of the poor (Mendez et al: 2013). It advocates the transformative and emancipatory involvement of small-scale farmers 'as a necessary component to develop a more sustainable agriculture'.

Many authors have seen the need for socio-economic structural reforms in order to achieve sustainable agricultural systems (Buttel: 1997; Rosset: 2003; Levin: 2006; Holt-Giménez: 2006; Perfecto et al: 2009; Altieri and Toledo: 2011), and political agroecology has been developed as a tool for guiding the examination of the key drivers of socio-ecological change by analysing interactions between actors at different scales, and how these interactions affect access, agency, and power at the local level.

In line with this approach it could be argued that smallholder sugarcane growers in Fiji have been forced by prevailing global capitalist and neoliberal ideologies into being part of what is now called the corporate 'food regime', defined as a 'ruled governed structure of production and consumption of food on a world scale'. In this case, it would be vital to analyse the political, social, and economic characteristics of the sugar industry, in the context of global capitalism, and the role that has been prepared for sugarcane growers in it, and implications that this has for their livelihoods.

11.3 Problems of the Sugar Industry

Chapter Eight describes a number of problems affecting the sustainability of sugarcane production and the livelihoods of sugarcane growers in Fiji that are giving rise to skepticism as to the future of the industry. From this study, it is difficult to define these problems definitively, as conditions within the cane belts vary. Some farmers say they have no problems at all, while others say they have many. Those smallholder sugarcane farmers who took part in this research, however, were not happy with their situation. They felt the risks are high, and that in the current system they are having to bear the burden of all the negative impacts on the industry. While farmers' situations vary, it is possible to identify some overall concerns.

At the most basic level, the main concern of the farmers growing sugarcane is the income they receive for their product. They are highly critical of this. Many promises of higher returns have been made, they say, but these have not been fulfilled.

> Election se pahile bolin raha ke FJ$85.00/tonne rahi…par daam to kamti hote jawe hai… FJ$120/tonne kardo…sab musibat dur hoi jai [Before the elections we were promised FJ$85.00/tonne for the cane…but the price seems to decrease yearly…better to raise the price to FJ$120/tonne and maintain it…everyone will be happy] (Labasa Farmer and a Sirdar: 2015).

An increase in the price they receive for their sugarcane would be the major factor easing their concerns and motivating them to increasing production. When the price for sugarcane is good, they tend to plant and produce more, when the price decreases, production levels remain constant or decline as farmers lose motivation. As producers for a global market, however, their incomes are subject to global price volatility, and the termination of FT premiums and increased competition from sugar producing giants such as Brazil, India, Thailand and Australia is making the prospect of higher farm incomes unlikely.

Costs are another problem. There are major costs associated with the harvesting and transporting of canes. During the harvesting season, growers need to hire extra workers for cutting and loading, but due to changing rural demographics, farm labour is becoming scarce. As a result, labour costs are high and rising. The transporting of cane to the sugar mills for processing is done by bulk carriage at specific times dictated by FSC, and the cost of this are high. A major complaint of farmers is that because of the poor financial position of the FSC, they are compelled to bear the costs of delivering their produce at the FSC gates, instead of the FSC buying from the farmer's gate.

The high price of inputs (fertilizers, herbicides, pesticides, and farming implements) is another problem, as is milling inefficiencies due to the breakdown of old machinery. The latter results in delays to harvesting and consequent lower cane yields with lower sugar content and has a demoralizing effect on farmers, as do grower and miller malpractices. Some agricultural officers are able to influence

harvesting and transportation schedules, and through their involvement in local cane gang politics are able to engage in practices of grower favouritism.

In Fiji, the cultivation of sugarcane is also challenged on the ecological front. Climate change, water constraints (drought), and severity of diseases all have an effect on the growth and productivity of farms. Then there is the ongoing problem of the non-renewing of land leases. Overall, the situation calls for innovative and creative solutions, but many farmers feel that the solutions being proposed by the major institutional stakeholders, such as the FSC and SRIF, are not creative and innovative enough to bring about the needed improvements to the system.

11.4 Solutions for the Sugar Industry

Cane agriculture in Fiji can be described as having grown like an organism, adjusting to survive, but certain structural features can be identified as having contributed to its difficulties. For example, the CSR initially discouraged diversification and encouraged mono-cropping; successive Governments have had no plans in place to cater for the declining number of leases; and the FSC has operated according to a governance system that has been bureaucratic in nature and shown little regard for the problems of the farmers. According to the National Federation Union General Secretary, the FSC is a 'badly mismanaged corporate entity replete with corruption, abuse, incompetence and inefficiency' (Fiji Labour Party: 2004).

Many solutions aimed at salvaging the sugar industry are now being proposed and implemented at the national level, but the farmers feel that they have had no voice in these proposals. They share a common feeling of having been unable to present their perspective on the solutions currently being proposed or implemented, and feel that as the industry is dependent on them for the sugarcane they supply, their views deserve greater attention.

The farmers involved in this research acknowledged that there are some good initiatives in place to assist them, but there are as many bad ones, and many imponderables that still need investigation, scrutiny and analysis. The SAP, for example, as part of the sugar industry reform process, is trying to force the farmers to utilize new methods to increase cane production by changing the ratoon cycle of the old varieties and adopting 'promising' new cane varieties, but this is being met

with farmer resistance. I was informed by a staff of SRIF that they are being hindered in changing production processes by the cane growers' responses to changing climate conditions.

> We are looking at a cycle of 8 years, but because of the changing climatic conditions, we are ever challenged with the pattern of cane farming exhibited by the cane growers. One way this could be done is increasing the unit productivity of an area which has a certain potential. But the hindrance to it is the weather which has deviated substantially over the past two decades resulting in long spells of drought (SRIF: 2015, Semi-structured Interview).

This research revealed that many of the solutions that the industry is trying to implement are being resisted by the growers on the grounds that they threaten to put them in a more disadvantaged position than they already are. For example, with regard to the proposed 'intensification' and 'diversification' of production, farmers say that these will increase their costs of production requiring them to borrowing more money and get further into debt. The cost of planting new crops, they say, is high. The cost of fertilizer, diesel, and the cost of hiring tractors are also high, and labor cost are now huge. While 'diversification' seems a promising option, the farmers are challenged by the need to finding the new markets for new products. So while the SRIF is coming up with the new cane varieties and new planting techniques, farmers are staying committed to their traditional varieties, farming practices, and planting methods.

The farmers' plea is:

> "to remain competitive…please reduce the costs for us somehow…we need to fix transportation issues by investing in our long-neglected rail system…please we need to move away from lorry transport and all the high costs associated with it…it is not that *you* always have to make a profit, what about *our* profits" (Master Farmer: 2015, Sigatoka).

11.5 Building on Sugarcane Growers Indigenous Technical Knowledge

The findings showed that sugarcane production is not the only source of farmer incomes, but it is the major source for many, and it affects the livelihoods of almost a quarter of the country's population, directly or indirectly. The FSC's interest in increasing production, and the farmers' concern about costs and income are therefore understandable, but they should not be the only consideration. In their influential critique of conventional analyses of rural development, Chambers and Conway (1992) and Chambers (1997) warn that measures of employment, production, and cash income are not the only measures that need to be taken into account. Such measures are popular, they say, because they are easy to measure and fit into the industrial notions of development, but alone they do not portray an accurate picture of people's livelihoods. In this light, Chambers and Conway (1992) present a comprehensive livelihood framework for rural development that takes into account socio-cultural, environmental, spiritual and emotional aspects of livelihood. Since then, the livelihood approach has been influenced by several disciplines and development approaches, including political ecology, economics, agroecosystem analysis, participatory rural appraisal, geography, farming systems research, and anthropology (Scoones: 2009).

One of the key foci of these new approaches is the knowledge that local farmers possess (Malerba: 2002; Brush: 2005; Shennan: 2007). This is knowledge specific to a certain sector of national production that is produced by farmers themselves by paying attention to their actions and the outcomes thereof (Armitage et al: 2008). The long connection of sugarcane growers to the sugar industry in Fiji has produced just such a body of knowledge that I have here called Indigenous Technical Knowledge (ITK). It is one of the arguments of this thesis that this knowledge has important survival value for the growers, and could have important survival value for the sugar industry as a whole.

The research found that sugarcane growers have been conducting experiments in their cane fields since the *Girmit* days to build on their existing ITK. This traditional knowledge plays a key role in providing food security, conserving plant genetic resource, maintaining financial stability, spreading market risks, reproducing local culture, and protecting human health and the environment. A full discussion of all

of these elements has not been possible in this thesis, but the thesis does provide a guide to further action towards the valorisation of this knowledge as a means of reaching the sustainable agriculture goals of the smallholder cane farming communities in Fiji.

In Agroecology, both traditional and modern scientific knowledge are combined, and in line with this approach, this study has sought to capture the ITK of it research participants who over many decades have been experimenting at the on-farm level. This study has identified the various forms that these experimentations have taken including, but are not limited to, those outlined below:

1. Experimenting and examining the qualities of their soil and sugarcane varieties;
2. Introducing new or partially new methods of sugarcane cultivation in order to evaluate and explore the success or failure of their introduction;
3. Taking into account scientific procedures related to the cultivation of new cane varieties proposed by sugar industry stakeholders such as SRIF and FSC, testing the new cane varieties efficiency, and demonstrate their compatibility to the climate and soil properties;
4. Taking new courses of action and tentatively adopting them without being sure of the outcome, as in the case of *tamtam* and *sukhlai* (farming activities that requires supplying the plot with a germinating ratoon or cane seed);
5. Involvement in activities which are deigned to cover, test or prove certain phenomenon or scientific principles such as ‘dual row cane planting’ - a newly introduced method for increasing cane production – and the advantages of intercropping and the use of animals over the use of machinery;
6. Observing deeply the results of changes induced by themselves on their farms, and testing the results with the opinion or statements of others, as in the case of learning from older generations practices such as weed management, intercropping, terracing, traditional methods of crop cultivation, etc. in the management of cane fields;

7. Comparing something already proven with something unproven, as in the case of the effects of changing climatic patterns on the overall sugarcane cultivation and production.

Haverkort (1991) states that the scientific community has rarely paid attention to farmers' research methodologies and research results or offered support for them, even though farmers continuously experiment and innovate in order to maintain and improve agricultural production. Bentley (2006) reports that until now there has been only a few tools available for documenting or disseminating farmer's experiments and innovations. In Fiji, the sugarcane grower's capacity to experiment and innovate using their ITK is unappreciated. It has been subverted by the activities of research centres such as SRIF, FSC, and those of multinational enterprises. The scientific research carried out by these organizations is usually conducted under controlled and standardized situations that hardly reflect the real-life situations of the growers. For this reason, modern scientific agricultural research needs revision if it is to be productive for ecologically sustainable agriculture, or assist in the transition toward it.

11.5.1 Innovation and Invention

Closely linked to farm experimentation are practices of 'innovation' and 'invention'. Rogers (1995) defines an innovation as an idea, practice or object that is perceived as new by an individual or other unit of adoption. This means that the idea, practice or object does not necessarily have to be new to be perceived as an innovation. Invention, on the other hand, is understood as a new idea or technology, which is discovered or created for the first time. Smallholder sugarcane farmers in Fiji have been both innovative and inventive in many ways.

The sugar industry in Fiji has always been dynamic and volatile. Since its inception in 1882, it has been heavily dependent on the conventional agricultural paradigm, and as has been shown in this study, it has been focused mainly on the uptake and adoption of new technologies as a solution to its problems. As a result, sugarcane growers have had to deal with continuing changing circumstances and possible pitfalls. This has led to an increase in their local knowledge through experimentation and testing. Anderson (1993) argues that adaptation frequently occurs in the process of technology adoption, and Chambers (1983) writes that the

introduction of almost any new technology or method is complemented by farmer's experimental activities, the resources available to the farmers, and the local conditions.

Farms in the four cane belts in Fiji are characterized by diverse condition, and the needs of sugarcane growers in these areas are heterogeneous, reflecting site-specific contexts. Reece and Sumberg (2003) argue that it is impossible for any one single experimentation or innovation, developed outside of site-specific contexts to meet all requirements. Therefore, farmers are left to adapt innovations to their own situation through a process of testing and experimentation. Bentley (2006) writes that in order to cater for changing conditions, farmers have to be able to adjust their ways of working and their farming systems. Farmer capacities to experiment, test and innovate have been an important aspect of the development of sugarcane agricultural systems in Fiji.

11.5.2 Internal and External Factors

Changes in farming practice are rooted in two different categories of factors affecting the growers; (i) internal and (ii) external. The internal factors are those linked directly to the farmer and include such things as age, demographics, gender relations, relatives, social status, farm work organization (cane gang, s*irdar* and *collumber* politics, accessibility to labour), production processes, declining farmer incomes, farm size and agricultural production conditions (refer Chapters Six and Seven). It is important to understand the complex interactions between farm economics, local-level industrial politics, farming technology, grower social traditions and the biological environment by analysing the issues of access, control and power that shape the growers lives and their farms.

External factors include interactions and changes at the wider political, social, ecological, cultural, economic, agroecological and biophysical levels. External environmental factors such as farm topography and specific land characteristics tend to influence the willingness and possibility for growers to experiment on their farm. For example, growers with farmland situated on a slope use trial and error methods to prevent soil erosion, while extreme weather events, such as droughts, can trigger experimentation with new irrigation methods, as seen in the Lautoka region of Fiji (refer Figure 9.15).

The field of cultural anthropology can help in analysing these complex interactions by looking at such issues as environmental identities[51], social movements, and local knowledge systems and how culture shapes the management and use of nature. These are all important aspects of the survival strategies of the sugarcane grower community.

The sugarcane farms and farmers, as isolated and localized as they may appear to be, are also connected to the global sugar markets and global governance structures through their participation in the global marketing of sugar, as in the case of FT certification and strict principles needed to be adhered to in order to sell at FT prices (refer Section 10.2.4.2). Profits, if any, are highly dependent on world market prices of sugar that notoriously fluctuate. I concur, therefore, with Pimbert et al (2001) who write that it is imperative to go beyond looking at local issues in isolation and exploring how events at national or global levels may be affecting local elements at the farm level, and vice versa.

In this study, special attention has been given to the potential of the ITK of smallholder sugarcane growers to contribute to agricultural sustainability and the restoration of the declining sugar industry in Fiji. As Chambers (1983; 1984) informs, the ITK of the farmers may appear simple and basic, and lack scientific validation, but its value is that it reflects the day-to-day life of farmers and their needs. It is knowledge validated in the laboratory of their farms. The output of such farmer laboratories has, however, not always been of interests to scientists.

In the context of the current crisis facing the sugar industry in Fiji, the ITK of sugarcane growers could be an important source of innovation leading not only to improved grower livelihoods but also improved industry performance. But for the

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[51] One part of the way in which people form their self-concept: a sense of connection to some part of the nonhuman natural environment, based on history, emotional attachment, and/or similarity, that affects the ways in which we perceive and act toward the world; a belief that the environment is important to us and an important part of who we are. An environmental identity can be similar to another collective identity (such as a national or ethnic identity) in providing us with a sense of connection, of being part of a larger whole, and with a recognition of similarity between ourselves and others. Also like a group identity, an environmental identity can vary in both definition and importance among individuals (Clayton. 2003. Environmental Identity: A Conceptual and an Operational Definition. In S. Clayton & S. Opotow (eds.). *Identity and the Natural Environment: The psychological Significance of Nature* (pp. 45-65). Cambridge, MA, US: MIT Press).

benefits of such knowledge to be realized nationally, sugarcane growers and scientists will have to work together, and this will require hard core agricultural scientists becoming more down-to-earth and learning to see things from a grower's perspective.

According to the smallholder growers who took part in this research, their ITK is one of the most important factors contributing to their survival on their sugarcane farms. It forms part of a broader strategy of constant experimentation and transformation that has, over the generations, led to farm innovations and inventions aimed at achieving food security, ensure environmental sustainability, independence from the large-scale commercial seed industry through the production of their own cane variety seeds, cultivation methods and production practices adapted to local climate.

ITK can play a major role in improving livelihood standards by reducing farmer dependency on the external inputs such as synthetic fertlizers, herbicides and pesticides. This is important as the cost of these inputs are high and have negative environmental effects. The need to reduce this dependency goes hand-in-hand with endeavours to increase environmental sustainability and increase food security. ITK involves an active search for solutions to current problems faced by sugarcane growers, and it is through building on the existing ITK through further farm-site laboratory experimentations that sugarcane growers can expand their scope of action.

An important area of contention has been the relative merits of traditional versus new hybrid varieties of sugarcane. Farmers report that while traditional varieties tend to have lower productivity than commercial hybrids in years with favourable seasonal conditions, they are a safer strategy for keeping producing in the years with irregular climatic conditions such as drought. Another reason for the use of traditional varieties of canes is the costs of seeds. Traditional varieties are less expensive, as in most cases the seeds form part of the old ratoons, or are easily accessible from within their networks in the gangs or from other cane farming communities. Farmers demonstrate a high degree of environmental awareness in their understanding of local trends in climate and on-farm conditions and continue

to resist the use of transgenic cane varieties that are not adapted to on-farm conditions and local climate.

The responses of the smallholders involved in this study suggests that the maintenance of local cane varieties, and knowledge of how to use them, is influenced by the social cohesion and reciprocity within their communities. The farmers usually rely on their elders, and farmer relatives who play an important role in assisting during adverse situations. The farmer participants in this research expressed a sense of community pride in maintaining local agricultural practices, and resisting the displacement of local practices by externally sourced commercial practices such as those promoted by SRIF and FSC. They reported that traditional methods of cultivation and management of cane fields have been maintained to adapt to local climate adversities and their social, cultural (family tradition) and economical means and modes of reducing farm maintenance costs.

The 'Convention on Biological Diversity (CBD)' has given a clear mandate for on-farm conservation of agrobiodiversity, stating that it is of paramount importance for future world crop production (Wood and Lenne´: 1997). The genetic diversity of traditional crops is the most economically valuable part of the global biodiversity. The use of traditional varieties is supported not only by the CBD, the agroecology paradigm also emphasizes the need for the conservation of crop genetic resources and the environments in which they occur, since conservation allows for continued dynamic adaptation of plants to the environment. Extensive research is needed to increase the cane diversities available to the farmers and to enhance their capacity to manage these diversities dynamically. The development of quality cane varieties requires more research and inclusion of information from farmers so that the industry as a whole can come up with varieties that will suit every region of Fiji, and will be able to adapt to prevailing agroecological conditions. Increasing genetic diversity of sugarcanes, combined with the cane growers' experimental abilities, underpinned by the formal system, will ensure greater on-farm conservation of agrobiodiversity.

11.6 The Retention of Local Farming Systems

The retention of local farming systems in Fiji is a robust strategy for adapting to adverse effects. The important issue is the agility of smallholders to respond to changes in agricultural practices. Without its cultivation and exchange by smallholders over successive generations, much of this local knowledge is likely to have disappeared under pressure of adapting to conventional agriculture. Reciprocity, commitment to tradition, and strength of social networks all contributed to the ability of growers to maintain their ITK. The semi-autonomy derived from the cohesion of these communities enables them to resist the complete displacement of local knowledge by scientific knowledge.

The key factors contributing to the development and maintenance of this strategy are the self-reliance and social cohesion of the farmers, and the reciprocity and semi-autonomy that they have developed as a result. Ironically, a lack of money or access to credit can be one reason why growers continue to maintain their ITK. The lack of financial resources is a key factor driving the development of local and low cost adaptation measures. Rapid social change could influence the future viability of the ITK. Exposure to money or credit has the potential to impact local adaptation strategies of smallholder growers.

The *Girmitiya* history of sugarcane agriculture in Fiji is one of resistance and adaptation to larger economic and political forces. Although their freedom of choice has always been limited, there has been enough scope for action for the growers to try out new and different things. Thus, ITK and farmer experiments can be of value for achieving sustainability in terms of developing individual sugarcane grower capacities for problem solving. A key finding of this research is the importance of resistance in fostering local strategies that are sustainable and work best for the growers.

11.7 Transition to Agroecology

There is increasing recognition by academics (Altieri and Toledo: 2011; IAASTD: 2009; Gliessman: 2007; Francis et al: 2003; Altieri: 1987) and global governance structures (FAO: 2014; FAO and ILO: 2013) that agrobiodiversity and agroecology will play a central role in a transition towards a more equitable and sustainable agri-

food system; one that will ensure food security for a growing population and maintain a healthy ecosystem. The expansion of such agroecological practices can be achieved through valuing and building upon existing farmer ITK. If farmers could recognize the potential of their ITK they could become drivers for the development of a new type of agriculture based on sustainable production supported by the agroecology paradigm.

For the smallholder cane growers of Fiji, such a transition to agroecology could be achieved only if the Government of Fiji (MoS and MoA) was to invest in policies and activities that facilitate bottom-up development and training to increase individual sugarcane grower's capacity. Case studies from across the globe have established that small farms utilizing agroecological practices are, per area, more productive than large-scale industrial farms (Krebs and Bach: 2018; Kremen et al: 2012; Altieri and Funes-Monzote: 2012). In this case, the FSC bringing farms under its management through the AFS would be fatal for small-scale sugarcane production in Fiji. If, however the MoS and MoA were to prioritize small-scale farming, and promote agroecology based on the ITK of sugarcane growers to the extent that they promote industrial agricultural practices and technology, many of the problems facing the sugar industry in general, and the smallholder sugarcane growers in particular could be solved.

To understand the difficulties in bringing about such a transition it is important to analyse decision-making processes and power structures that exist within the sugar industry. The industry consists of a diversity of stakeholders interacting with each other, exerting different levels of power across the sugarcane belts, and all searching for one answer to the question of how to salvage the declining sugar industry on which a quarter of Fiji's population rely on either directly or indirectly for their livelihoods. As things currently stand, the biggest challenge facing the up-scaling of agroecology in the sugarcane belts of Fiji is the push by policy-makers, industrial stakeholders and big businesses to intensify the industrialization of agriculture.

The perceived legitimacy of this industrial model has been achieved by the continuous lobbying, financial influence, and political power of a few international conglomerates that have captured and shaped the sugar industry, its institutions, and its agricultural research program. Strategically placed industry mouthpieces in

sugar industry-backed bodies perpetuate messages in favour of industrialization in the media by feeding journalists with agribusiness spin. At the same time, critiques of this system by farmers, cane producer associations, and SCGC are attacked as being anti-science, driven by ideology, and based on emotions and erratic trial and error research methods.

Policy makers are blinded by the reductionist view of industrial agriculture, leading them to work hand-in-glove with the global sugar corporations to promote their technological solutions over the heads of the public, and to subvert scientific bodies (research and academia) and regulatory agencies such as the SIT through the presence within them of key figures with sugar industry links. Transnational corporations that have embedded themselves within the policy-making machinery via the SAP have managed to capture policy making for the sugar industry in Fiji. With the result, the majority of the sugarcane growers have been marginalized.

These international conglomerates, together with seed developers, fertilizer and pesticide manufacturers and dealers, and sugar processing companies, have achieved full spectrum dominance over the industry through the SAP by being granted a strategic role in the negotiation and framing its proposals for land intensification, product diversification, and the mechanization of sugarcane agriculture.

Stemming from an industrialized, globalized international system of trade based on export oriented sugarcane mono-cropping, such solutions represents an attempt to legitimize the appropriation of what is essentially the sugarcane growing communities' common wealth, and hand it over to powerful transnational corporations, via the FSC, to milk for their own profits. The result will be loss of biodiversity, degradation of soil, pollution of water sources, and squeezing of farmers off their land, thereby devastating the traditional resource base of the *Girmitiya* sugarcane farming community.

11.8 Lessons from Cuba

In the search for comparative world examples of sugar industry collapse and agroecological recovery, one striking example stands out: that of Cuba. After the Cuban Revolution of 1959, the Cuban government supported large-scale, export-oriented monoculture agriculture, exporting sugar, citrus, coffee, tobacco to

countries in Eastern Europe at favourable prices and importing industrial agricultural inputs – chemical fertilizers and pesticides, farm machinery and petroleum - and processed food (Funes-Monzote: 2010, 212). With the collapse of the USSR and the socialist countries of Eastern Europe in 1989, Cuba lost its principal markets and was no longer able to import sufficient food or industrial agricultural inputs (Rosset et al: 2011, 166). Consequently, its high-input, industrialized, and large-scale agriculture dramatically collapsed (Funes-Monzote: 2010, 214) and the 1990s saw the Cuban population facing an economic and food crisis (Rosset: 1997; Rosset et al: 2011, 166).

The first response was a strategy of import substitution. A wide range of bio-fertilizers, green manures, worm humus, compost and cover crops were developed to substitute for chemical fertilizers (Warwick: 2001; Funes-Monzote: 2010, 224). The traditional practice of using oxen for cultivation and transport was revived. Weed control converted to mechanical means and biological controls, crop rotations and polycultures were adopted for pest control (Funes-Monzote: 2010, 226). Further changes involved the adoption of the Mixed Farming System (MFS) and holistic management programme based on agroecological principles: (a) system bio-diversification, (b) soil fertility conservation and management, (c) optimization of nutrient and energy cycles and processes, (d) optimal use of natural and local available resources, (e) maintenance of high levels of resilience in terms of systems sustainability and stability, and (f) use of renewable energy (ibid: 229).

Major structural changes in the agricultural sector created the precondition for a nationwide application of a mixed farming strategy. The deactivation of 110 (of 155) sugar mills released half of the more than 1.4 million hectares formerly devoted to the monoculture of sugarcane for other agricultural purposes, e.g., crop production, fruits, reforestation, and livestock (Funes-Monzote: 2010, 227). Government assistance, together with its encouragement of innovation, the high educational level of the population, and the exchange of resources and knowledge among the people, permitted the creation of a sustainable agriculture movement and its implementation at a national scale (ibid: 232) but the most important changes were social organizational.

Virtually all peasants in Cuba belong to the National Association of Small Farmers (ANAP), and almost all of them belong to one of two types of cooperatives: Agriculture Production Cooperatives (*CPAs*), and Credit and Service Cooperatives (CCSs). *CPAs* are collective farms in which the land and all productive assets like machinery, warehouses, etc. are owned collectively. Credit and Service Cooperatives (CCSs) are made up of peasant families who own farms and work them individually, but group together in the CCS to achieve economies of scale in marketing harvests, obtaining credit, sharing farm machinery, etc. (Rosset et al: 2011, 166).

The CCSs proved to be the most agile and adaptable to the changing conditions. Decisions concerning production methodologies were made by the individual family level meaning that they could rapidly adopt alternatives to scarce inputs. Their members typically exhibited a strong sense of belonging to, and caring for, the land, making CCS families initially very open to ecological practices. On the other hand, the CCSs were administratively weak, and not particularly adept at marketing products, managing finances, navigating government programs, etc. The *CPAs* tended to have a much stronger administration and good infrastructure, but the assigning of work teams to areas on a rotating basis meant there was little attachment to the land and no readily discernible link between hard work and remuneration, which led to lower productivity. Decisions were made in the assembly of the full membership rather than at the family level which meant that technological changeovers could take much longer (Rosset et al: 2011, 167).

The most successful methodology for promoting farmer innovation and horizontal sharing is the Campasino-a-Campasino (CAC) farmer-to-farmer methodology. CAC is a participatory method based on local peasant needs, culture, and environmental conditions that unleashes knowledge, enthusiasm and protagonism as a way of discovering, recognizing, taking advantage of, and socializing the rich pool of family and community agricultural knowledge which is linked to their specific historical conditions and identities (Rosset et al: 2011,170). Promoters are recruited from farmers who are recognized by their peers for the successful innovations and agroecological practices employed on their own farms and their desire and ability to teach others. Their farms are their classrooms, and other farmers visit them to learn (ibid: 171). The spread of agroecology was rapid and

successful largely due to the CAC social process methodology that the ANAP used to build grassroots agroecology movement. Another key to success was respect for local culture and customs in each locality, and the process would emphasize recovering, valuing, recognizing and promoting local knowledge, and complementing but not overwhelming it with knowledge from outside (ibid: 185).

The uptake of agroecology within the peasant sector of Cuban agriculture has had significant impacts on productivity, climate resilience and family dynamics. In the area of farm production (not including food production for self-provisioning or informal exchange), farm level data from 33 farms demonstrated that the greater the level of agroecological integration, the greater the total value of production, both per worker and per hectare (Rosset et al: 2011, 177-181). Given its geographic location, Cuba is one of the countries hardest hit by the extreme climate events associated with climate change, and in recent years, this has meant severe droughts, increasingly unpredictable rainfall patterns and more powerful hurricanes. Data from one region in 2008, suggested that agroecology contributes to building farms that are more resilient to environmental disturbances with climate change than conventional farming systems (ibid: 181-183).

> Field work in one region in 2008, 40 days after Hurricane Ike had devastated agriculture in that region, large areas of industrial monoculture were observed where not 5 percent of the plants were left standing. By comparison, in numerous agroecological peasant farms with multi-storied agroforestry farming systems only 50 percent on the taller crop plants (tall plantain varieties and fruit trees) had been knocked down, while lower story annual and perennial crops were already showing exuberant growth, taking advantage of the added sunlight from the upper stories having been felled or lost leaves and branches. Just 60 days after the storm, the most agroecologically-integrated farms had a greater than 80 percent recovery, and by 120 days they had recovered almost 100 percent of their estimated productive potential. The averages for the least integrated farms did not reach the 80-90 percent recovery range until six months (180 days) later, lending support to the observation that

> the more agroecological farms show possible greater resilience to hurricanes (Rosset et al: 2011, 183).

Finally, the transition from conventional monoculture to diversified agroecological farming also appeared to be having impacts on the structure, role and power relations inside the peasant family. With a conventional monoculture the 'crop belongs to the man. He drives the tractor, plants, applies chemicals, harvests and sells the crop. And all the money goes to him'. As the farm is diversified through participation in Campesino-to-Campesino Agroecology Movement (MACAC), the roles and income earning opportunities for the different members of the nuclear and the extended family are also diversified. Diversification of opportunities was also bringing members of the nuclear family (sons and daughters who had moved to town) and extended family (grandparents, aunts, uncles, cousins) back to the farm to engage in productive labour [or] reconsidering previous plans to move to the city (Rosset et al: 2011, 183-184).

The impact in terms of national food self-sufficiency is still limited, with the country still importing about 50 percent of its food and only half of the suitable land being in cultivation. Thus, food security remains tenuous (Fernandez et al: 2018). Avery (2013) has pointed out that the shortcomings of Cuban agriculture are because of market inefficiencies and the bureaucratic weaknesses of a highly centralized governance system. Altieri and Funes-Monzote (2012), Stricker (2010), Simón et al (2010), and Koont (2009) state that market inefficiencies and bureaucratic weaknesses has negatively affected urban and sustainable agriculture programs on health, employment, and the environment in the country.

While Cuban agriculture is responding to this situation with emphasis on diversification, decentralization, and greater food self-sufficiency, the limiting factor is that many high-level policy- makers continue to have a conventional green revolution/industrial agriculture mind-set. The work of strengthening farmer organizations is critical, therefore, for achieving further structural and policy changes. According to Rosset et al, while Cuban peasants have greatly benefited from a supportive state, the scaling up of agroecology requires a peasant organization and a socially dynamic methodology like CAC (Rosset et al: 2011, 186-187).

11.9 Chapter Summary

This chapter has drawn together the literature in the areas of agroecology, rural development, livelihood studies, agronomy and farmer knowledge with the findings of the research to discuss the problems and solutions facing the industry, and the possibilities of building upon sugarcane growers ITK as a source of new strategies for solving livelihood and environmental problems. It has argued for extending the scope of agroecology to include a more political dimension, and on the basis of that has explored the obstacle to the retention of traditional farming practices and a transition toward a more agroecological farming system.

Chapter 12 Conclusion

12.1 Introduction

This thesis seeks to answer a number of question at variety of levels: What is the nature of the current crisis facing the sugar industry in Fiji and what are its causes; What solutions have been proposed for overcoming the crisis; What has been the role of smallholder sugarcane growers in the development of the Fiji sugar industry; What is their current livelihood situation; What Indigenous Technical Knowledge (ITK) do smallholder sugarcane growers in Fiji have that might be useful in helping to overcome the current sugar industry and rural livelihood crises; What institutional/policy changes would be necessary to help facilitate ITK based solutions; What agricultural paradigm – 'Industrial' or 'Agroecological' – holds the greater promise for a sustainable agricultural future; and above all, it is concerned to present an account of the ITK of smallholder sugarcane growers in Fiji, and assess what this knowledge might contribute to a solution to the current crisis facing the sugar industry in Fiji, and what institutional/policy changes would be necessary to facilitate its application.

12.2 A Perfect Storm

The sugar industry in Fiji is currently facing a 'perfect storm' – wave after wave of major difficulties coming all at once – and the country is beginning to tackle these problems only as they reach crisis point. In **Chapter Eight**, these problems were analysed as *Problems of World Trade*: the loss of international market access and the ceasing of FairTrade (FT) premiums; *Problems of Production*: declining farm production, declining farmer numbers, loss of productive land to urban development, ongoing milling inefficiencies, increasing crop losses from tropical cyclones due to global climate change, and degradation of the ecosystem and loss of agrobiodiversity; *Farmer Problems*: loss of industry representation, insecurity of land tenure, scarcity of labour, rising costs of transport and farm inputs, and an increase in local level political conflicts.

Of these problems, the loss of confidence in the sugar industry and demoralization of the growers is one of the most urgent (Vaniqi: 2012). Together with the inadequate development of infrastructure in the cane belts, it is leading many

farmers to abandon their homes and farms in pursuit of a better quality of life for themselves and their families elsewhere. In this thesis, we are concerned with discovering what the sugarcane growing community is able to offer by way of their ITK a solution to the sugar industry's problems, and what structural changes might be needed to re-invigorate that community and make its ITK-based solution available.

12.3 Proposed Solutions

Since the 1980s, several measures have been put in place to counter the problems facing the industry, but the focus of these solutions has been largely upon increasing sugar production. Little attention has been given to the broader livelihood problems of the farming population. This has led to a growing gap between the expectations of sugar industry institutions and those of the growers, broadening the distance between them.

As described in **Chapter Nine,** the solutions currently being implemented to ensure a future for the industry - 'intensification', 'diversification', and 'mechanization' - are failing to attract the commitment of sugarcane farmers. Deviation from traditional farming methods and practices, and effort to further mechanize and industrialise farm agriculture, whilst promising higher levels of production, are receiving little support from the cane growing community and have the potential to degrade farm agroecological systems further (Burrows and Sclomowitz: 1992).

12.4 Theoretical Framework Revisited: Agroecology vs Industrial Agriculture

The 'perfect storm' analogy used above has also been used by Altieri and Toledo (2011, 589) for the world food crisis of the 2007-08 which sent an additional 75 million people, especially in the regions of Asia and sub-Saharan Africa, into the ranks of the world's hungry. The resulting food shortages were in no way related to the usual cause of hunger in those regions, i.e., drought, but were related instead to the doubling of the prices of staple food such as rice and maize on the world market. This can be attributed to inequities inherent in a contemporary global corporate food regime based on a model of export-oriented agriculture that pays little attention to the needs of domestic populations. The failure of this regime to distribute available

food surpluses at prices accessible to low income populations, and the resulting food riots that this failure caused in many parts of the world has seriously questioned the integrity and long-term viability of conventional agricultural strategies, models and approaches.

The long-term viability of conventional industrial agriculture has also been questioned for its heavy reliance on the application of industrial inputs that are having a devastating effect upon ecological sustainability. The dependence of new seed varieties generated through conventional plant breeding or genetic engineering on the use of synthetic pesticides and fertilizers and associated large-scale irrigation systems is imposing a high costs in environmental degradation such as soil erosion, salinization, chemical pollution, loss of native crop genetic diversity and reduction in overall biodiversity (Altieri: 2009). Increased yields are being bought at the cost of increased degradation of terrestrial, freshwater and marine habitats, erosion of biodiversity, and global warming. In the age of the Anthropocene, industrial agriculture practices have exacerbated the causes of climate change by contributing at least 25 percent of the global greenhouse gases and about 60 percent of nitrous oxide emissions (Barker: 2014). Yet even these estimates may, according to Valenzuela (2016), be grossly underestimated due to the ever-changing intensity of the industrial agricultural farming practices around the globe.

The innovative technologies of the 'Green Revolution', that transformed the world's agriculture after the end of World War II, ostensibly to feed the ever-increasing world population (Vandermeer and Perfecto: 2012), has now become 'conventional agriculture'. And while the mainstream media, academic communities, and policy-makers continue to espouse the value of capital intensive high-input agricultural systems as the key to feeding the world population (Barker: 2014), in the 21st century this 'conventional agriculture' has become branded 'environmentally destructive' (Valenzuela: 2016, 2). Leading researchers and scientists, such as Altieri (2009), Gliessman and Rosemeyer (2010), Altieri and Toledo (2011), and Holt-Giménez and Altieri (2013) have criticised it for its negative economic, social and environmental consequences of the globe. They claim that the global food, energy, climate, and financial crises are all entangled with the impact of conventional western industrial scientific agriculture.

As Chapter Eight demonstrates, the sugar industry in Fiji bears all the hallmarks of this 'resource-intensive, environmentally destructive' brand of agriculture. It relies heavily on the top-down transmission of conventional agricultural knowledge by extension officers of the FSC, who dictate to farmer's conventional methods of increasing crop yields. In doing so, they circumvent the smallholder farmers' own knowledge, needs and insights, ignoring their holistic ecological approach to farming. The concern is that if this continues, it can only further aggravate the environmental, social and economic difficulties already being faced by the smallholder grower communities and the industry at large.

12.4.1 Toward a More Sustainable Agriculture

In recent decades, there has been increasing demand for changes to the current dominant system of conventional industrial agriculture. New agricultural techniques and modes of agricultural development are being proposed that are especially aimed at restoring ecological sustainability to agriculture, and livelihood security for smallholder rural populations, especially in economically weak communities around the world. The IAASTD report, *Agriculture at the Crossroads,* adopts a view of agriculture "as a multi-output activity, producing not only commodities but also non-commodity outputs such as environmental services, landscape amenities and cultural heritages" (p4). It states, however, that historically, agricultural sciences have focused solely on delivering component technologies aimed at increasing farm-level productivity (a trend evident in Fiji). Formal Agricultural Knowledge, Science and Technology (AKST), it says, "has typically focused on increasing specialization of commodity production…on mainstream, input-intensive, irrigated mono-cropping systems…based on a linear top-down flow of technologies and information from scientific research to adopters" (p25). The Report argues that, given the new challenges confronting agriculture today, revision of this model is required.

In particular, the report argues for formal AKST "to be informed by knowledge about farmers' conditions, opportunities and needs, and by participatory methodologies that can empower small-scale producers" (p27). Formal AKST systems, it says, "require the revalorization of traditional and local knowledge and an interdisciplinary holistic and system-based approach to knowledge production

and sharing" (p5). To achieve this, "improvements are needed in engaging farmers in priority setting…in increasing collaboration with social sciences, and increasing participatory work in core research institutions" (p31). This calls for "multidisciplinary programs, cross-disciplinary learning and scientific validation, involving both research and non-research actors, and recognizing the cultural identity of indigenous communities" (p31).

The report calls for wider recognition of "traditional and local knowledge and community-based innovations" (p10), and argues that if development and sustainability goals are to be achieved, decision makers cannot afford to overlook this "extensive realm of accumulated practical knowledge" (p11). However, because such knowledge is "hard to present as statistical data, it is typically overlooked, undervalued and excluded" (p71). Therefore, in the field of education, a "more widespread application of collaborative approaches" is needed, involving "(a) complementary investments in the education of AKST technicians and professionals in order to strengthen their understanding of and capacity to work with local and indigenous individuals and communities; (b) support to curriculum developments that value and provide opportunity for field-based experience and apprenticeships under communities' educational guidance; and (c) farmers' access to formal training to enable them to connect to innovations in agroecology" (p73).

Independent scientists working in differing topographical regions of the world have recognized the value and legitimacy of the traditional knowledge and abilities in small-scale agrarian systems (Richards: 1985). More recently, researchers such as Carswell and Jones (2004), Pretty et al (1999), Berkes (1999; 2008), and Agrawal (1995) have confirmed the scientific validity of such knowledge. Scoones and Thompson (1994), Chambers and Ghildyal (1985), and Chambers (1983; 1995) write that farmers are always experimenting, and are equipped to formulate their own developments and tackle their own problems.

The sustainability of industrial agriculture, with its fossil fuel dependent technology and chemical inputs, is in doubt today because of the associated problems of soil degradation, pesticides accumulation, poor water management, gene erosion, and atmospheric and water pollution. The limitations of modern agriculture had been recognized by both farming communities and agricultural scientists all over the

world, and efforts are underway by both groups to promote alternative farming methods that are less dependent on purchased inputs and that can lead to a more "sustainable agriculture". In this thesis, efforts have been made to identify what farming methods embedded in the ITK of smallholder sugarcane growers may be adopted by the sugar industry to render it more ecologically sound, socially equitable and economically sustainable.

12.5 The Indigenous Technical Knowledge of Fiji Sugarcane Growers

In Fiji, there remains a close connectedness of people to nature (Dean: 2012b). Traditional food production systems, designed to meet both cash income and nutritional needs, are complex and reflect generations of careful observations of their agroecological and socio-cultural environments. To understand them requires the study of interrelationship among technical practices in specific farming systems – the conservation of crop varieties, the production of diverse cash crops (spice/fruit/flower/vegetables), maintenance of kitchen gardens; traditional methods of food preservation, arts and crafts, housing systems, divisions of labour, methods of fishery, animal husbandry and poultry raising; traditional forms of agro-forestry, use of forest products, and the construction of sacred groves; folk taxonomy, traditional perceptions of health, beliefs in the supernatural, and magico-religious performances.

This body of knowledge is embedded within local communities and underpins the ITK of small-scale sugarcane farmers in their choice of farming techniques, management of soil fertility, rotations of sugarcane and non-sugarcane crops, selection of cane varieties and crop combinations appropriate for local conditions and specialized environmental niches; their use of no-chemical pest control methods and of environmental parameters in the prediction of weather patterns and climate changes. It is a body of knowledge that has been accumulated continuously by careful observation and local experimentation since the early 1880s, and transmitted from generation to generation from the colonial days of indentured labour, through the CSR days of the immediate independence era, to the current post-independence days of the FSC. It is a knowledge of plant phenology, of using the phases of the moon to plan the planting of sugarcane, and the use of locally developed, readily available and affordable soil fertilizers, mulching ingredients

and crop management materials. Smallholder sugarcane farming in Fiji is sustained by farming practices informed by such knowledge for the improvement of soil structure, maintenance of crops, and the selection and cultivation of seeds. It is technical knowledge, self-developed and relied upon to generate sustained sugarcane yields and meet household needs. It is knowledge that has been helpful to small-scale sugarcane growers in maintaining sugarcane production and achieving food security at the household level, and could contribute to the development of sustainable agriculture policies for the Fiji sugar industry.

The ITK of the sugarcane growers in Fiji has evolved from constant farm-level experimentation over many decades. It is local knowledge, and its related practices have been produced outside the formal instructive framework of the industry. It is embedded in the culture and traditions of the cane-growing *Girmitiya* community as the basis for their local decision-making related to farm production, household food security, human and animal well-being, and natural resource management. It contains valuable lessons for the sustainable use of agricultural resources and the survival of the rural communities. Furthermore, it can offer viable alternatives to existing plans and policies for developing a sustainable sugar industry.

According to Muthuraman (1995), success in promoting sustainable agriculture can be achieved through developing components such as genetic diversity, crop diversification, integrated nutrient management, integrated pest management and sustainable water management. These are all components which have been described in **Chapter Seven** on the ITK of Fiji's smallholder sugarcane growers. The intention in documenting of this knowledge has not been to present the ITK of sugarcane growers as a singular remedy for the pressing problems of the Fiji sugar industry, nor to suggest that the ITK of Fiji's sugarcane growers is superior to, or should be seen as a replacement for, the scientific knowledge produced by the industry's research institutions in the FSC and SRIF. It is important not to idealize or romanticize ITK. There is, however, much to be gained from seeing ITK as a knowledge system complementary to scientific research. Whereas scientific knowledge is abstract and generalized, ITK has evolved as a practical adaptation to local realities and can therefore provide important lessons and insights as to what forms of scientific knowledge and industrial innovations are appropriate to Fijian circumstances.

It was seen that individual growers are capable of successful experimentation and innovation on their own account, and the incorporation of new elements of traditional knowledge into local cane farming folklore underscores the fact that ITK is dynamic knowledge system that can seamlessly incorporate new and useful elements. The same applies to combining of local indigenous knowledge with scientific knowledge. Following the introduction of new knowledge and practices by extension officers, growers independently modify their farming techniques in ways that most suit their local circumstances. In doing so, they arrive at practical solutions often not anticipated by the SRIF or FSC officials and scientists. This outcome reinforces the contention that ITK can help identify potential areas of collaboration between cane growers and scientists, and contribute to a genuine two-way flow of information, rather than a simple unidirectional flow of scientific knowledge and opinions. ITK can be seen as encompassing cost effective, participatory and sustainable development processes crucial for the rejuvenation of the sugar industry in Fiji. Its utilization, however, will require socio-economic changes so that its value can be recognized and sugarcane farmers empowered to utilize it. In this respect, the industry restructuring and legislative reforms currently being implemented as solutions to the problems facing the sugar industry in Fiji need to be critically assessed in terms of what level of support they give to the empowerment of the farmer community and the mobilization of their ITK.

12.6 Empowering the Farmer Community

In **Chapter Two**, it was pointed out that any transition from an unsustainable industrial system of agriculture to a more sustainable agroecological one would require major policy and institutional changes. Insofar as ITK is an important component of agroecological farming, the same constraints can be said to apply to its mobilization. It was also pointed out in Chapter Two that existing agricultural policies, institutions and agendas are backed by powerful economic and institutional interests unlikely to promote agroecological changes. This leaves smallholder farmers as the most likely agents for such a transition. In Fiji, however, smallholder sugarcane farmers have historically had very little voice in the industry, as was seen in **Chapters Five, Eight and Nine**. The current industry reforms being implemented in Fiji remain firmly committed to the same conventional industrial

'productivist' model of agriculture that has situated sugarcane growers in their subordinate position.

While it can be said that the standard of living of the cane grower communities has improved greatly since the indenture period, it is important to note that many in the cane growing community feel that, under the rule of the FSC, they have been facing yet another *Girmit* – another form of slavery. Most of their issues coalesce around the problems of representation, and the principal institutional spheres relevant to that issue are the SCGC and the SIT. As we saw in Chapter Ten, the SCGC was an elected body established by the Sugar Industry Act 1984 to represent the interest of all cane growers in Fiji, protect and further their interests, and provide them with representation, leadership and services (SCGC: 2016). In 2009, however, the Government, thinking that the SCGC was becoming too political, removed its elected board of councillors and replaced them with Government appointees thereby rendering it 'undemocratic' and 'toothless' (Prasad: 2016). ***The empowerment of the grower community would entail the restoration of the SCGC board of councillors elected by and from the grower community who were capable of solving grower issues effectively and efficiently.***

12.7 Mobilizing Indigenous Technical Knowledge

Any movement toward recognizing the value of the ITK of sugarcane farmers and mobilizing this for the benefit of the sugarcane industry as a whole would involve changes in the Master Award, the principle legislative instrument governing the industry and prescribing the rights and obligations of growers and FSC in relation to planting, cultivation and harvesting of cane by sugarcane growers. It used to be the SIT that had the power to change the Master Award, in consultation with the SCGC and the FSC, and under this arrangement, a mechanism would have existed for 'ITK friendly' amendments to be made.

Under the Sugar Cane Industry Reform Bill (2016), however, the SIT is to be absorbed by the MoS, and the power to amend the Master Award given to the Minister of Sugar. And with the SCGC being disempowered (as described above) as an organization representing the interests of the sugarcane growers, any change in the Master Award toward promoting ITK of the sugarcane growers would now require the support of the MoS and the FSC, both of whom are committed to the

further industrialization of the industry. ***The mobilization of ITK would entail restoring power to change the Master Award to the SIT in consultation with the FSC and an re-empowered SCGC.***

Another important support for the mobilization of farmers' ITK would be institutions such as the SRIF. Under the Sugar Cane Industry Reform Bill (2016), however, the SRIF is to be disestablished, and its core functions shifted to the FSC. It is envisaged that, in the future the Institute will no longer be an independent body, and will be controlled by the FSC. This means that the FSC will be able to dictate its research agenda, and given the FSC's commitment to industrial intensification, that agenda is unlikely to include agroecological research.

The mobilization of ITK would involve (following the IAASTD) a revision of research agenda toward a focus on "farmers' conditions, opportunities and needs", "participatory methodologies that can empower small-scale producers" (p27), "the revalorization of traditional and local knowledge and an interdisciplinary holistic and system-based approach to knowledge production and sharing" (p5), "engaging farmers in priority setting…increasing collaboration with social sciences, and increasing participatory work…multidisciplinary programs, cross-disciplinary learning and scientific validation, involving both research and non-research actors" (p31), and "recognizing…traditional and local knowledge and community-based innovations" (p10). And in the field of agricultural education generally (e.g., universities), it would involve "strengthening technicians and professionals understanding of and capacity to work with local and indigenous individuals and communities", "curriculum developments that value and provide opportunities for field-based experience and apprenticeships under communities' guidance", and "farmers' access to formal training" (p71). ***Short of the FSC's conversion to an agroecological research agenda, any hope of the above changes would be dependent on the restoration to the SRIF of its independent status.***

12.7.1 The Social Embeddedness of ITK

Agrawal (1995, 431-432) states that the main reasons for the disappearance of the indigenous knowledge are pressures of modernization and cultural homogenization under the auspices of the modern nation-state and the international trade system. Such pressures, he says, threaten the lifestyles, practices and cultures of local

populations, small agricultural producers, and indigenous peoples, and hence the preservation of their indigenous knowledge. Altieri (1989, 79) states that the protection of crop genetic resources cannot be safeguarded without protecting the agroecosystem and socio-cultural organization of the local people who maintain those resources, and likewise Agrawal argues that the protection of indigenous knowledge systems cannot be accomplished without the preservation of the communities that produce it. In this sense, ***in order to preserve indigenous knowledge in the cane fields of Fiji, we need to preserve the Girmitiya community.***

In this respect, the focus of the Sugar Cane Industry Action Plan 2013-2022 on the sugar sector's commercial viability and industry competitiveness represents a major threat to the *Girmitiya* sugarcane farming community. A major proposal of that Plan is for the "Purchase of Lease land by the FSC to establish direct control over the supply of sugarcane and reduce industry dependence on smaller, unviable production units". This is aimed at moving the industry away from smallholder farming systems to large-scale production systems, on the grounds that "the industry recognises that small production unit size is an impediment to industry growth and commercialisation". The ultimate aim is to acquire land off the smallholder growers and re-lease it as amalgamated farming plots to FSC trained new entrants. There is concern among smallholder farmers that the main motive for introducing AFSs is to do away with those farmers who are deemed 'underperforming,' or who are unwilling to accept the changes that the industry wants to bring about. It will give the FSC more power to dictate its own industrial land management and agronomic practices, and have the effect of further weakening the *Girmitiya* sugarcane growing community along with its ITK. ***The maintenance of smallholder sugarcane grower ITK and its utilization in finding solutions to the livelihood crisis and the crisis facing the sugar industry as a whole is dependent upon the maintenance of the smallholder system of production.***

12.8 Contributions of the Thesis

The key contributions of this study can be described in terms of four main areas. First, it contributes to the academic literature on the Fiji sugar industry by providing a perspective on it from the point of view of the smallholder sugarcane growers. As stated in the Introduction, a lot of academic attention has already been given to the lives of the *Grimitiyas* - the people and their descendants who were brought to Fiji from Colonial India by the British to work on the sugarcane farms as indentured labourers. Scholars have explored the history of the *Girmitiya* system and documented their harsh condition of life under the British and Colonial Sugar Refinery (CSR) rule. Other authors have described the economics of cane production, and much has been written on land tenure and its implications for the sugar industry. There remained, however, a wide opportunity to understand the problems facing the sugar industry from the perspective of the smallholder sugarcane farmers and what these farmers feel about the solutions currently being offered to resurrect the industry. This thesis aims to fill this gap.

Second, given the cross-disciplinary nature of the investigation and the uniqueness of the population under study, the thesis has, as described in **Chapter Three**, customised its own 'research inquiry model' using a mixture of qualitative and quantitative research methods. The use of such mixed methodologies is common in agrosystems research where it is used to provide greater insights into different levels and units of the research cohorts. Additionally, it allows results from one method to be used to develop and inform results from the others. For example, qualitative results obtained from livelihood and agroecosystem analysis using participant observation, informal interviews, focus group discussions, and semi-structured interviews can be converted into numerical data to derive statistical conclusions. This approach can be replicated in future agroecological research.

Third, on the conceptual level, the thesis aligns itself with the agroecological approach to agriculture. But whereas this approach is normally used in investigations of traditional peasant agriculture, this thesis applies it to an originally un-free, immigrant labour force who had been forced to adapt, first to a foreign industrial regime of politically disciplined plantation agriculture, and then later, as dependent smallholder commodity producers, to the demands of an externally

controlled global market system. It is hoped that in this way the thesis might contribute to broadening the field of application of agroecology to the revitalization of rural populations and agricultural resources degraded by industrial exploitation.

The above innovation was made possible by a fourth, i.e., the extension of the usual definition of Indigenous Technical Knowledge (ITK) to include the wisdom of a population that, while not indigenous to a particular territory, is indigenous to a particular historical experience and industrial location, out of which it has developed its own unique culture, traditions, and knowledge. Just as there was a gap in the literature on the Fiji sugar industry for documenting the perceptions of the sugarcane growers, so there was a lack of documentation of the wisdom which this group has developed over the years of their employment in the sugar industry - a sector to which they are, in the sense described above, indigenous, and which is integral to the *Girmit* community as the basis of their identity in Fiji and the world. There is no other literature documenting the ITK of the sugarcane growing *Girmitiya* community. This investigation into their ITK, also adds, in small measure, to literature on spirituality of the community, has linked the environment, agrobiodiversity, and indigenous substances used by the *Girmitiya* populations of Fiji. These forms of knowledge are of interest not only in and of themselves but also as the basis for farmer well-being in the cane belts of Fiji. It is an aspect of indigenous knowledge that might be productively researched further in the future.

It is fair to say that the custodians of this practical and cultural knowledge have always been the *Grimitiyas* and their descendants, until in recent decades when *iTaukei* farmers have also taken up sugarcane farming. The current pool of remaining cane farmers in Fiji has learned the techniques and methods of cane farming from their ancestors who in turn explored and learned from their own experiments and exposures on the cane fields, and this research was designed to understand how ITK might aid in preserving ecologically diverse agrarian holdings even as they help to promote food and income security for the smallholder sugarcane farmers in Fiji. It is based on ecological principles that were found to be in close harmony with the growers' traditional practices, and it is hoped that its outcomes might be useful to the Ministry of Sugar Industry, the Ministry of Agriculture in Fiji, Ministry of Environment, NGOs, institutions associated with the sugar industry, and educational institutions, national farmer associations and

research institutes in helping to identify some additional important measures that need to be taken into account in the reform of the sugar industry in Fiji.

12.9 Directions for Further Research

As the first venture of its kind into the analysis of ITK in Fiji, the thesis has been unable to cover the whole domain. It leaves many areas for future research. In the first place, the analysis is limited to the information received from those research participants that it was possible to establish contacts and selection, as described in Chapter Three. It was impossible to establish contacts with and recruit the representatives of every stakeholder in the sugar industry and every sugarcane farmer group, and was only able to document problems identified in areas of the cane belt that were accessible for by the researcher. I was told by one participant that if I wanted to observe and understand the worst struggles facing farmers then I had to visit the interiors of Vanua Levu, such as Seaqaqa, Daku, Wainikoro and Natua Sectors, but I did not have the opportunity to do this given the relative distance of these places from where I was working. Different findings may have resulted if the research was conducted in other rural areas of Fiji. ***There remains the opportunity for further research by broadening the range of participation and representation in order to present a more representative picture of the sugarcane grower's livelihoods in Fiji.***

Participant observation as a research instrument made female members of the household uncomfortable. They frequently became embarrassed when being observed in their normal everyday tasks, and when female household members were asked to discuss topics concerning their farms and livelihoods, many of them passed the questions over to a male member present. This was partly a function of traditional gender relations within the *Girmitiya* sugarcane growing community, and partly the function of my status as male. ***There is an opportunity for suitably qualified female researchers to undertake research among women sugarcane growers and their experience and perceptions of sugarcane farming.***

The study on the ITK were limited to the following themes: Traditional Methods of Land Preparation and Cane Planting; Use of Environmental Indicators and Parameters; Traditional Methods of Increasing Yield; The Farmer as Scientist of his Soil and the Farm as his Laboratory; Traditional Methods of Harvesting the

Cane; The Use of Livestock for Sustenance and Diversification; and The Use of Medicinal Plants and Beliefs in the Supernatural. ***ITK of sugarcane growers is a new area of research in the sugar industry and further research opportunities exist in this area.***

Most importantly, successful solutions to problems facing the sugar industry in Fiji will require strong collaboration between all stakeholders. This thesis has identified significant structural problems in the way of securing this collaboration at present. ***This leaves open a vast and important area of research into how collaborative structures engaging all interested parties can be successfully established with the aim of facilitating a more effective set of solutions to the problems facing the sugarcane industry in Fiji today.***

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Appendix A: University of Waikato Ethics Approval

Dr Colin McLeay
Senior Lecturer
Programme Convenor

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THE UNIVERSITY OF WAIKATO
Te Whare Wānanga o Waikato

Mohseen Riaz Ud Dean
Dr Keith Barber
Dr Fiona McCormack

Anthropology
School of Social Sciences

25 November 2014

Dear Mohseen

Re: **FS2014-48 Smallholder Sugarcane Growers and the Sugar Industry in Fiji: Indigenous Technical Knowledge and Agrobiodiversity Conservation**

Thank you for submitting your amended application to me. I have reviewed it and am happy to provide you with formal ethical approval as you have satisfactorily addressed all the matters raised in my previous letter.

I wish you well with your research.

Kind regards,

Colin McLeay
Acting Chair
Faculty of Arts and Social Sciences Human Research Ethics Committee

Appendix B: Fiji Government (MoA) Ethics Approval

MINISTRY OF AGRICULTURE

Hugh Robinson Complex
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Raiwaqa,
Suva,
Republic of Fiji.

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Helpdesk: (679) 338 3583
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Website: www.agriculture.org.fj
Facebook: Department Of Agriculture Fiji

File: 1/6

Date: 02/12/14

To Whom It May Concern:

The Ministry has given clearance for **Mr. Mosheen Riaz Ud Dean (Student No. 1215541)**, a PhD Student of the University of Waikato, Hamilton, New Zealand to conduct this research survey in the identified sugar cane farrms in the Western Division of Viti Levu.

Ropate Ligairi

Permanent Secretary for Agriculture

PERMANENT SECRETARY FOR AGRICULTURE

Appendix C: Conditions of Becoming a Participant

UNIVERSITY OF WAIKATO
FACULTY OF ARTS AND SOCIAL SCIENCES

The Role of Traditional Indigenous Knowledge (TIK) in the Conservation and Sustainability of Agrobiodiversity, with reference to Small-Holder Farmers producing cane on the Fiji Islands.

I am a PhD student at the University of Waikato. As part of my Doctor of Philosophy thesis, I am undertaking research on "**The Role of Traditional Indigenous Knowledge (TIK) in the Conservation and Sustainability of Agrobiodiversity, with reference to Small-Holder Farmers producing cane on the Fiji Islands".** The aim of my research is to understand how Traditional Indigenous Knowledge Systems may aid in preserving ecologically diverse agrarian holdings even as they help to promote food and/or income security for these farmers.

The objectives of this research are to:

1. Examine the role of traditional indigenous knowledge in the maintenance and sustainability of food and productive security on smallholder cane farms in Fiji
2. Examine the value of non-cash-crop production and income from other products' apart from sugar and the factors affecting it
3. Analyse the different types of Agrobiodiversity and their importance in the cane fields
4. Outline the measures taken by farmers and other relevant stakeholders in the cane industry to diversify, intensify and conserve agricultural production systems including the development of new markets for value-added Agrobiodiversity
5. Find out the major challenges and constraints faced by cane farmers, outlining the key issues for consideration by policy-makers to ensure the continued engagement of farmers in the conservation and use of Agrobiodiversity in the cane fields

Interviews, Focus Groups and Questionnaire sessions:

For this research, I hope to conduct several interviews and questionnaire sessions and 2-5 focus groups. The interviews will be approximately half to an hour in length. Your opinions and thoughts are important so you are welcome to bring up any issues that you consider important to my research. Focus Groups are more like informal discussions between 5-8 people where you can offer your views about the topic and also hear what others have to say. Each focus group will approximately take one and a half to two hours.

I would like to invite you to participate in an interview, questionnaire sessions and/or a focus group. I would like to audio record the interview and focus groups so that I have an accurate account of your views and opinions.

What are your rights as participants?

If you choose to participate in my research, you have the right to:

1. Refuse to answer any particular question(s)
2. Withdraw from the research up to a month after the interview
3. Decline to be audio recorded and request that recorder be turned off at any time
4. Request that any material be erased
5. Ask any questions about the research at any time during your participation

Confidentiality

I will ensure, to the best of my ability that all interviews and discussions remain confidential and a pseudonym (fake name) will be used in any publications so that you stay anonymous. All written notes and transcripts will be kept in locked cupboards in my office at the University of Waikato. Any information stored on a computer will only be accessible through a regularly changed password. Only I will have access to the transcripts and electronic information.

This research project has been approved by the Human Research Ethics Committee of the Faculty of Arts and Social Sciences of the University of Waikato. Any questions about the ethical conduct of this research may be sent to the Secretary of the Committee using email fassethics@waikato.ac.nz or Faculty of Arts and Social Sciences, Te Kura Kete Aronui, University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240.

The Results

The results of my research will be used as part of my Doctor of Philosophy Thesis. As such, four copies of my thesis will be produced, three hard copies and one accessible online. The findings may also be used in presentations and journal publications.

What Next?

If you would like to take part in the research, I will contact you in the next week, so we can organize a time to meet. If you have any questions about the research, please feel free to contact me or my supervisor.

Mohseen Riaz Ud Dean

Appendix D: Consent Form- Individual Interviews

RESEARCH CONSENT FORM- Interviews

Description of Project: This research aims to understand the role of traditional indigenous knowledge (TIK) in the conservation and sustainability of agrobiodiversity, with reference to small-holder farmers producing cane on the Fiji Islands.

I have read the information sheet and understand that:

1. I can refuse to answer any question, terminate the interview and can withdraw from the research up to a month after my interview
2. All personal identifying information will remain confidential
3. My identity will remain anonymous and be protected by a pseudonym unless I state otherwise
4. All information collected will remain secure in a locked cupboard or on a computer accessible by password only
5. Information will be used for a Doctor of Philosophy thesis, presentations and journal articles

I consent to our conversation being audio recorded YES/NO (please circle)

I (your name) _____ agree to participate in this research and acknowledge receipt of a copy of this consent form and the research project information sheet.

_____

(to be signed and dated by participant)

_____

(to be signed and dated by Researcher)

Appendix E: Consent Form- Focus Group Discussions

RESEARCH CONSENT FORM- Focus Group Discussion

Description of Project: This research aims to understand the role of traditional indigenous knowledge (TIK) in the conservation and sustainability of agrobiodiversity, with reference to small-holder farmers producing cane on the Fiji Islands.

I have read the information sheet and understand that:

1 I can refuse to answer any question and can withdraw from the research up to a month after the focus group
2 All personal identifying information will remain confidential. Shared personal information and views at the focus group will be kept private to those within the group
3 My identity will remain anonymous and be protected by a pseudonym unless I state otherwise
4 All information collected will remain secure in a locked cupboard or on a computer accessible by password only
5 Information will be used for a Doctor of Philosophy thesis, presentations and journal articles

I consent to our conversation being audio recorded YES/NO (please circle)

I (your name) _____ agree to participate in this research and acknowledge receipt of a copy of this consent form and the research project information sheet.

_____

(to be signed and dated by participant)

_____

(to be signed and dated by Researcher)

Appendix F: Semi-structured Interview Schedule

This schedule outlines some of the topics that I would like to discuss during our interview. You do not have to answer every question and you are welcome to bring up other issues not covered on this schedule.

1. How long have you been working with the smallholder cane farming communities in Fiji?

2. What do you think of the terms "Re-diversification, Re-intensification and Conservation of Agrobiodiversity" with specific reference to smallholder cane farming communities?

   Prompt: Are there any potential to diversify, intensify and conserve any type of agrobiodiversity as major sources of livelihoods for these farmers and why?

   What are the major issues to be addressed to cater for the above and what should be the approach?

3. What are your views on the livelihood crisis currently faced by these vulnerable communities?

4. What do you and your organization think of their livelihood priorities?

5. Can you identify some of the agricultural policies administered by you or your organization that is relevant to these livelihood priorities?

   Prompt: In what ways do you think that these livelihood priorities have had an impact on the livelihood strategies of these communities?

6. Do you have any policies that are yet to be implemented concerning these small holder cane farms/farmers?

7. In what ways have these policies benefitted these small holder farming communities?

8. What do you think are some of the limitations of these policies on the livelihoods of these poor farmers?

   Prompt: What is the level of understanding of these policies among the cane farmers?

What is the level of participation of these farmers in the development of such agricultural policies?

9. What measures are in place to implement each policy?

   Prompt: What challenges and constraints do you face while implementing them?

10. Are any of these policies channelled through any other stakeholders/ institutions or organization, if so, then how?

    Prompt: In what shape do these institutions and organizations exist locally/internationally?

    What other institutions may affect local responses to policy

    What other institutions may directly or indirectly affect such policies?

11. What is your opinion on empowering smallholders to influence these policies

    Prompt: What opportunities are in place for these smallholder cane farming communities to directly influence such policies?

    What opportunities are in place for them to indirectly influence these policies?

12. What do you think are some of the current livelihood issues facing this smallholder cane farming communities?

13. What do you think may be some of the solutions to their problems?

14. What do think of revitalising their Traditional Indigenous Knowledge as the foundation for fostering sustainable livelihoods and as well eliciting detailed information on their traditional ecological knowledge and practices about the natural environment and resource conservation?

Appendix G: Focus Group Discussion Schedule

This schedule outlines some of the topics that I would like to discuss during our Focus Group Discussion. You do not have to answer every question and you are welcome to bring up other issues not covered on this schedule.

- How long have you been a smallholder cane farmer?

- What are your five major agricultural livelihood sources as smallholder farming communities?

  Prompt: What are some of the other ways in which people in your farming communities make a living?

  What are the different ways in which people in your farming communities meet their daily food needs?

- How does different sources of food and income vary among seasons in a normal year?

  Prompt: Which months are the leanest times in terms of food and income?

- Do you see any potential to re-diversifying, re-intensifying and conserving of agrobiodiversity to improve your livelihood?

  Prompt: If yes, what? And if no, why?

  What do you think is the level of understanding among the farmers in relation to farm diversification, intensification and conservation of agrobiodiversity?

  Do you recall making any agreements or binding to any agricultural policies?

  Prompt: If yes, can you identify the five major ones over the past three years?

  What are the some of the benefits of these policies?

  What are some of the limitations of these policies?

- What do you think are the major issues to be addressed by the policy/ research/extension for sustaining your livelihood priorities and strategies?

  Prompt: What do you think should be their approach?

- What is your opinion on empowering smallholders to influence these policies?

  Prompt: What opportunities are in place for the smallholder cane farming communities to directly influence such policies?

  What opportunities are in place for you to indirectly influence these policies?

- What do you think are some of the limitations of these policies on your livelihoods as smallholder cane farmers?

  Prompt: What is the level of understanding of these policies among the cane farmers?

  What is the level of participation of these farmers in the development of such agricultural policies?

- Does any member of the farming community hold an elected position in any of the farmer organization?

  Prompt: What is the level of participation of this member and acceptance of this individual?

- What shocks (environmental, political, social, and economic) has recently affected your output and productivity level?
-
- Does any organization provide any technical training or assistance in agricultural practices and technology to these cane farming communities?

  Prompt: Who provides this service?
  Is this service also available for your household cultivates?
  Has your household used this service within the past year?
  Did your household have to pay for the service (cash or kind) when you used it?

- What are some of the major problems you encounter as small holders?

- What do you think are the solutions to these problems and/or issues?

- What do think of revitalising your Traditional Indigenous Knowledge as the foundation for fostering sustainable livelihoods and as well eliciting detailed information on your traditional ecological knowledge and practices about the natural environment and resource conservation?

Appendix H: Livelihood Survey

Country Belt: _____ Participant Name (Optional) Code: _____
Village Name: _____ Household GPS Code: _____
Farm GPS Code: _____ Type of Dwelling: _____

A. Location (Identifying Information)

Itinerary (How to find the dwelling):

_____

_____

_____

_____

Compound Clustering: (< 5 houses /5-10 houses /> 10 houses)

_____

B. Household Determination (Determining Household Situation)

Family Type: _____

Number of people occupying the dwelling: _____

Does the family farm together? _____

Does the family cook together? _____

Does the family live together? _____

House Division: _____

Household Head: _____

Genealogical Diagram:

Any absent member	Sex (M/F/O)	Reason for absenteeism	Period of absenteeism	Are they considered part of the household where they stay? Y or N

Members staying out of the house for less than 6 months	Sex (M/F/O)	Reason for leaving the house	Period of absenteeism	Are they considered part of the household where they usually go/stay? Y or N

C. Household Characteristics			**Ethnicity:**		**Religion:**	
No	Relation to HH-Head	Age	Place of Birth	Education Level	Main Economic Activity	Other Economic Activities
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

D. Household History (Settlement Description and History of the Household)

How did the participant start the household?

_____

Was it in the same village or elsewhere?

_____

What were the participants' main economic activities during the initiation period?

_____

If elsewhere, when did he/she leave the original place?

_____

Reason for leaving the original place?

_____

Have the household lived anywhere else?

_____

What were the participants' main economic activities during that period?

_____

When did you move to that place?

_____

If yes, when did he/she leave that place?

_____

Reason for leaving that place?

_____

Place of residence for absent household members:

_____

Household occupations:

_____

E. Family Networks

Does the household have relatives in the village?

Do they assist each other with farm and/or other activity?
Do they give or receive food from these relatives?
Do they give or receive cash from these relatives?
Have such forms of mutual aid increased/decreased or stayed the same over time?

Does the household have relatives outside the village?

- Do they assist each other with farm and/or other activity?
- Do they give or receive food from these relatives?
- Do they give or receive cash from these relatives?
- Have such forms of mutual aid increased/decreased or stayed the same over time?

Does the household have relatives outside the town?

- Do they assist each other with farm and/or other activity?
- Do they give or receive food from these relatives?
- Do they give or receive cash from these relatives?
- Have such forms of mutual aid increased/decreased or stayed the same over time?

Does the household have relatives outside Fiji?

- Do they give or receive help from these relatives (consumer goods/clothing/ etc.)?
- Do they give or receive cash from these relatives?
- Have such forms of mutual aid increased/decreased or stayed the same over time?

F. Farm Characteristics and Land Tenure

Does the household own land?

Does the household farm?

Household Farming Characteristics (Description)

Does the household also farm land that they do not own?

Does the household farm all the land they own?

What does the household do with the land they own and do not farm?

G. Agricultural Production and Practices (Land used by household for agriculture in all the agricultural seasons)

Total amount of land owned by the household (Hectare/Acre)?

Total amount of land utilised during peak cane season?

Total amount of land utilised during off-peak cane season?

Total amount of land utilised for subsistence agriculture?

Is the amount of land used for agricultural purpose during the peak season similar in amount or has it increased or decreased in comparison to previous years?

If decreased, what are the two most important reasons why it happened?
Possible Solutions:

Decreased production due to decrease in need (increased household consumption/expenses/etc.)

Decreased production due to decrease in demand- losing market (for existing or new crop)

Had less capital (not borrowed) in reserve to invest in agriculture (hire labour/rent or buy equipment/etc.)

Had less credit (cash or in kind) to invest in agriculture (hire labour/rent or buy equipment/etc.)

Had less land that the household did not have to pay for

Had less labour available (due to member illness, member migration, small household/etc.)

Had lack of access to draught power that you did not have to pay for

Could not afford more inputs that were highly expensive or otherwise being low subsidised

Lower prices for crops discouraged the household to plant more

More of the land used for agriculture was useable (less damage from floods/weeds/etc.)

Land became unusable (flood/draught/weeds or pest infestation/etc.)

Other reasons: _____

Not applicable/no other reason

If increased, how and what are the two most important reasons you used more land?
Possible Solutions:

Increased production due to increase in need (increased household consumption/expenses/etc.)

Increased production to meet new demand (for existing or new crop)

Had more capital (not borrowed) in reserve to invest in agriculture (hire labour/rent or buy equipment/etc.)

Ability to access more credit (cash or in kind) to invest in agriculture (hire labour/rent or buy equipment/etc.)

Had access to more land that the household did not have to pay for

Had access to more labour that the household did not have to pay for

Had access to more draught power that you did not have to pay for

Could afford more inputs that were less expensive or otherwise subsidised

Higher prices for crops encouraged the household to plant more

More of the land used for agriculture was useable (less damage from floods/weeds/etc.)

Began using land left fallow in previous years

Other reasons: _____

Not applicable/no other reason

How does the household cultivate the land?
Possible Solutions:

Tractor

Horses

Bullocks

Manual Labour

Others: _____

Not applicable/none

H. Household farming and division of labour

Division of work amongst members of the household

What are the different responsibilities of the household members and how is work divided among the two genders?

Possible Tasks	Crops exchanged for goods or other services	Crops for household consumption	Crops sold for cash income	
Ploughing				**M: Male HH member** **F: Female HH member** **S: Shared amongst HH males and females** **HL: Hired labour** **O: Others** **NA: Not applicable**
Hoeing				
Planting				
Weeding				
Applying fertilizer				
Applying pesticides				
Irrigation				
Harvesting				
Shelling/threshing				
Post-harvest cleaning				
Post-harvest sorting				
Storage				
Transportation of produce				
Selling/negotiation				
				Any other tasks identified

I. Domestic Expenditure

How much does the household spend on a monthly basis for domestic consumption on the following items?

(If possible collect cash register receipts from the participants)

Household Items	Monthly cost	Household Items	Monthly cost
Flour		Dairy Products (milk, egg, etc.)	
Sugar		Salt	
Rice		Alcohol and Tobacco	
Bread		Fruits and Vegetables	
Oil/fat		Meat and poultry	
Butter		Fuel (transport)	
Water Bills		Fuel (cooking)	
Electricity Bills		Snacks and drinks	
Toiletries		Fast food items	

J. Rent and House maintenance

What is the current monthly rent of the household?

_____

If the household does not pay rent, then calculate monthly maintenance fee:

_____

K. Other important expenditures

Expenditure Type	Cost per annum
Medical Expenses, health care	
Education (books, school fees, uniform, transportation, shoes, school bags, etc.)	
Clothing, shoes (except for those required for school)	
All equipment and tools (excluding agricultural tools and equipment)	
Construction materials	
Repayment of debt	
Social events and gathering (funeral, parties, year- end celebrations, weddings, etc.)	
Gifts/Remittances	
Cost of inputs for raising crops including agricultural equipment, tools and labour	
Cost of raising livestock including the cost of buying livestock, feed and labour	

Which types of expenditure has increased over time and why?

_____
_____
_____
_____
_____

What is the household doing to cope with such rising expenditures?

_____
_____
_____
_____
_____

In the past ten years, how many years did you have to buy your own sugar?

_____
_____
_____
_____
_____

Which months of the year do you think you have high expenditures and why?

Month	Tick (√) if expenditure is high during that month	Reason for high expenditure
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

L. Income Generating Activities

Cash- Income Generating Activities

Household Member	Source of Income (Activity)	Time of the year this activity carried out	Estimate of income	Estimate of time invested

Non-Cash Income Generating Activities

a. Are there members of the household part of any other farming group or farm? Y or N
How many of them are working there? _____
Are they in paid labour? Y or N
What is their total income per annum? _____

b. Did any member also work on other farms for exchange of food or services? Y or N
What type of goods and services are received by the household for such an activity?
_____
_____
_____
_____

c. Does the household get any food out of hunting and gathering? Y or N
Specify:
_____
_____
_____
_____

d. Does the household get any food out of other activities? Y or N
Specify (e.g. fruit trees, gardening, etc.):

_____
_____
_____
_____

e. Did you receive any food aid in the past 12 months? Y or N
Specify:

_____
_____
_____
_____

f. Has your non-farm income increased, decreased or stayed the same over time? Describe the trend.

_____
_____
_____
_____

g. Has the number of income sources for your household increased, decreased or stayed the same over time? Describe the trend.

_____
_____
_____
_____

M. Household Assets

Identify the following or any other items and their quantities currently owned by the household and are in working conditions.

Household Item	(√) or (X)	Quantity	Household Item	(√) or (X)	Quantity
Modern Chair			Refrigerator		
Table			Sofa set		
Bed			Cell phone/landline		
Entertainment (TV, DVD, etc.)			Laptop/Computer		
Stereo/Radio			Sewing Machine		
Washing machine			Vehicles (cars, vans, tractors, etc.)		
Cloth dryer			Stove		
Generator					

N. Housing and Amenities

Housing structure:

1.) Roofing **(√)**	2.) Walls **(√)**	3.) Floor **(√)**
____ Thatched	_____ Concrete	_____ Wood
____ Corrugated	_____ Wood	_____ Concrete
_____ Plastic	_____ Iron sheets	_____ Mud/dirt
_____ Tarpaulin	_____ Thatched	_____ Iron sheets
_____ Other	_____ Other	_____ Other

Main source of drinking water: **(√)**

_____ Tap
_____ Lake/River
_____ Well/spring
_____ Borehole
_____ Rain Water
_____ Other

(If Tap is not the source of water, carry on with the next two observations for this section)

On a daily basis, what is the total number of trips made by all members of the household to fetch water from the water source? _____

Including waiting time, about how much time does one trip usually take to fetch water for household consumption? _____

What type of toilet facilities exist for household use? **(√)**

_____ Flush
_____ Water seal
_____ Pit (improved)
_____ Pit (unimproved)
_____ None (bush/field)

What type of cooking fuel does the household use? **(√)**

_____ Kerosene
_____ Firewood
_____ Gas
_____ Electricity
_____ Earth oven
_____ Other

What types of lighting fuel does the household use? **(√)**

_____ Kerosene
_____ Generator
_____ Firewood/Candles
_____ Electricity
_____ Solar panel
_____ Other

Is the household sometimes forced to sell off their possession just because they need cash? Y or N

Have there been years that the household were forced to sell off more possessions than usually? Y or N
Years:
_____
____

Have your possession increased, decreased or stayed the same over time?
_____

Why?
_____

Appendix I: Agroecosystem Analysis

A. Cropping types during peak and off-peak season

What are the five most important crops planted or harvested during peak and off-peak seasons:

Season	**Valuable Crops**		**Did you intercrop this with any other crop? Which ones**	**Amount of area utilised for planting this crop (hectares/ acres)**	**Total Harvest: _____ (Kgs)**		**Seed**					**Use of Pesticides**	
					Quantity	Quantity of others	Of the seed you used to plant this crop, what quantity had you retained from your own production? (Kgs)	If you had to buy this seed, what would it have cost? (FJ$)	How much improved/ certified seed did you buy to plant this crop? (FJ$)	How much indigenous seed did you buy to plant this crop? (FJ$)	Considering cash and in kind, what do you think was the total payments you spent on indigenous and improved seeds? (FJ$)	What are the inorganic forms of fertiliser applied to this crop	What are the indigenous forms of fertiliser applied to this crop
Peak	(1)												
	(2)												
	(3)												
	(4)												
	(5)												
Off Peak	(1)												
	(2)												
	(3)												
	(4)												
	(5)												

Note: Crops for peak and off-peak season will use numbering from the above table for the remaining of the analysis.

B. Agricultural Expenses

Crops							Harvesting, Selling, Bartering and goodwill giving of Crops								Challenges
Peak Season	How much did you spend on non-labour expenses to plant, raise and harvest this crop (e.g. land costs, irrigation, etc.)	Any paid labour for the crop (FJ$)	Days of labour hired for from the initial till the final stages of harvesting	What is the total amount paid considering both cash and in-kind payments	How many days of labour did you hire for other tasks paid by the time spent for this crop	What is the total amount paid considering both cash and in-kind payments	Harvested (√) (Kgs)	Bartered (√) (Kgs)	Given out on goodwill (√) (Kgs)	Sold (√) (Kgs)	Total cash received for selling	Total cost (both cash and in-kind) incurred to sell this crop (e.g. transportation/ storage, drying, etc.)	Which member of the household made the decision to sell the crop	Did you face any difficulty in selling this crop	What was the two most significant problem you had encountered while selling this crop?
(1)															
(2)															
(3)															
(4)															
(5)															
Off-peak season															
(1)															
(2)															
(3)															
(4)															
(5)															

C. Different Crop Varieties, Pesticide and Fertilizer Application

How much did you spend on buying pesticides, weedicides or herbicides during the Peak Season?
How much did you spend on buying pesticides, weedicides or herbicides during the off-peak season?

Peak Season	**5 most common varieties (Indigenous Names)**					**Fertilizer types**	**Total costs of fertilizer per annum**	**Pesticide types**	**Total cost of pesticide per annum**
(1)									
(2)									
(3)									
(4)									
(5)									
Off Peak Season									
(1)									
(2)									
(3)									
(4)									
(5)									

D. Intercropping of Crops

Peak Season Intercropping

Crops							Harvesting, Selling, Bartering and goodwill giving of Crops								Challenges
Peak Season	How much did you spend on non-labour expenses to plant, raise and harvest this crop (e.g. land costs, irrigation, etc.)	Any paid labour for the crop (FJ$)	Days of labour hired for from the initial till the final stages of harvesting	What is the total amount paid considering both cash and in-kind payments	How many days of labour did you hire for other tasks paid by the time spent for this crop	What is the total amount paid considering both cash and in-kind payments	Harvested (√) (kgs)	Bartered (√) (kgs)	Given out on goodwill (√) (kgs)	Sold (√) (kgs)	Total cash received for selling	Total cost (both cash and in-kind) incurred to sell this crop (e.g. transportation/ storage, drying, etc.)	Which member of the household made the decision to sell the crop	Did you face any difficulty in selling this crop	What was the two most significant problem you had encountered while selling this crop?
(1)															
(2)															
(3)															
(4)															
(5)															

Off Peak Season Intercropping

Crops							Harvesting, Selling, Bartering and goodwill giving of Crops								Challenges
Off Peak Season	How much did you spend on non-labour expenses to plant, raise and harvest this crop (e.g. land costs, irrigation, etc.)	Any paid labour for the crop (FJ$)	Days of labour hired for from the initial till the final stages of harvesting	What is the total amount paid considering both cash and in-kind payments	How many days of labour did you hire for other tasks paid by the time spent for this crop	What is the total amount paid considering both cash and in-kind payments	Harvested (√) (Kgs)	Bartered (√) (Kgs)	Given out on goodwill (√) (Kgs)	Sold (√) (Kgs)	Total cash received for selling	Total cost (both cash and in-kind) incurred to sell this crop (e.g. transportation/ storage, drying, etc.)	Which member of the household made the decision to sell the crop	Did you face any difficulty in selling this crop	What was the two most significant problem you had encountered while selling this crop?
(1)															
(2)															
(3)															
(4)															
(5)															

E. Sale of Crops during the seasons

Season / **Peak Season Crops**	Which crops did you harvest or sell during the season? (√)	How much of the quantity that you harvested have you sold, bartered, goodwill exchanged or used to repay loans?				Main reason for not selling this crop ***(Possible answers below from Note 1)***	Considering cash, the value of in-kind goods and the value of what you bartered or used to repay loans, what was the total amount you received for what you sold?	Which member of the household made the decision about how (timing, buyer, price, etc.) to sell this crop? ***(Possible answers below from Note 2)***	What was the total value of all costs (both cash and in-kind) you incurred to sell this crop (e.g. transportation, storage, cleaning, drying, market, fees, commission, taxes, etc.)	Did you have any difficulty in selling this crop?	What were the two most significant problems you had faced whilst selling this crop? ***(Possible answers below from Note 3)***
		Total Quantity (Kg)	Sold (√)	Bartered (√)	Repay loans (√)						
Off-Peak Season Crops											

Note 1: Possible Reasons for not selling the crops-

1. Had surplus but there did not arise a need/want to sell
2. Wanted to sell but price was not attractive
3. No surplus to sell
   F: Female HH member
   S: Shared amongst HH males and females
4. Had surplus, but no one to sell the crops to
5. No affordable access to markets
6. Had surplus to sell but awaiting to sell it off later
7. Other reasons:_____

Note 2:
M: Male HH member

HL: Hired labour
O: Others
NA: Not applicable

Note 3: Possible Reasons for not selling crops-

1. High cost of transport to market
2. Low prices in accessible markets
3. High market fees or taxes
4. Poor transportation or road conditions
5. Restrictions in trade
6. Not able to meet crop quality
7. Unpredictable prices
8. Lack of price information
9. Difficult/unable to find buyers
10. Farmer organizations not effective to fetch good price for goods
11. Late or slow payment from buyers
12. Other reasons: _____

F. Use of Staple Commodities

5 significant staple crop		Considering all the significant staple crops that you harvested during the season, about what proportion in percentage did you…….. Sell, barter, gave away or used to repay loans	Retain for sale later on	Lose due to spoilage from pest infestation during storage or used for other than its intended use because of spoilage	Retain for consumption in your household	Retain specifically for seed or animal feed	**Ask this question if loss due to pest infestation is greater than 0%.** What was the main cause of loss during storage? ***(Possible answers below from Note 1)***	**Ask this question if loss due to pest infestation is greater than 0%.** How did you store the portion of this crop that you consumed in your household? ***(Possible answers below from Note 2)***	**Ask this question if percentage for commodities sold, bartered, given away, used to repay loans and retained for sale later is greater than 0% combined.** How did you store the portion of this crop you sold immediately or later on? ***(Possible answers below from Note 2)***	How did you dry this commodity? ***(Possible answers below from Note 3)***
Peak Season										
1.										
2.										
3.										
4.										
5.										
Off-Peak Season										
1.										
2.										
3.										
4.										
5.										

Note 1: Possible reasons for storage loss-

1. Moulds
2. Pest/Insects
3. Rats/Mice/etc.
4. Other animals
5. Others: _____
6. Don't know

Note 2: Possible Storage Options

1. Traditional granaries
2. Indoors- in bags/baskets
3. Indoors- open storage
4. Outside- open storage
5. Underground
6. Under the house
7. Wrapped in leaves
8. Others: _____
9. Not applicable
10. Others

Note 3: Possible drying methods-

1. On the ground
2. On tarpaulin
3. On Iron sheets
4. Mechanical dryer
5. Cribs
6. Hanging
7. Sun dried
8. In the field
9. Salt dried
10. Others

Five significant staple crops (List them here from previous table)			Did you dry this commodity adequately to reduce spoilage during storage?	What structure did you use to store this commodity to avoid pest and moisture infestation	Did you treat this commodity with any chemicals to avoid pest and moisture infestation	Considering the commodities sold, about what proportions in percentage did you…….			Of the portion of the commodities you sold, about what proportions did you……..		***(Ask this question if any commodity is more than 0% for harvests sold within a month timeframe)***	Was there a market for better quality than what you sold (less moisture, fewer pest infestation, etc.)? ***(If answer is no, proceed to the next question?)***	What was the main reason you did not improve the quality for this buyer/ market? ***(Possible answers below from Note 2)***
						Sell to or through a farmer's organization	Sell yourself at the roadside	Sell somewhere other than the road side	Sell within a month of harvest	Store and sell at a later stage	What was the main reason you sold this crop within one month of the harvest ***(Possible answers below from Note 1)***		
Peak	1.												
	2.												
	3.												
	4.												
	5.												
Off/ Peak	1.												
	2.												
	3.												
	4.												
	5.												

Note 1: Possible reasons for selling at harvest-

1. **Needed immediate cash**
2. **Could not store for other reasons**
3. **Received a good price offer**
4. **Others: _____**

Note 2: Possible reasons for not improving quality-

1. **Normal practice met buyer specifications**
2. **Not cost effective (No increase in price of commodity)**
3. **Not cost effective (Increase in price but does not justify the costs)**
4. **Farmers organizations provided other alternatives**
5. **Cannot meet buyer specification (drying, sorting, cleaning)**
6. **Others: _____**

G. Farm Plots **Farmer type: Hoe/bullock/tractor/shared farming** **(Possible answers below from Note 1)**

Plot No:	Size (acres)	Use	Location		Soil Type	Fertility	How acquired?	Tenure Status	Crops (in order of significance)	Sowing time	Harvest time	Harvest Quantity (Kg)
			Distance to home	Distance to water Table								
1.												
2.												
3.												
4.												
5.												

6.												
7.												
8.												
9.												
10.												

Note 1: Possible Solutions to the table above-

A. Use:	**B.** Distance to Water Table:	**C.** Soil Type:	**D.** Fertility:	**E.** How Acquired?	**F.** Tenure Status
1. Subsistence	1. Valley bottom	1. Gravel	1. Describe per plot	1. Inherited	1. Usufruct from Mataqali
2. Cash crop	2. High	2. Sand	2. Rank Plots	2. Permission sought	2. Usufruct from farm owner
3. Grazing	3. Medium	3. Loam		3. Purchased	3. Privately owned
4. Fallow	4. Low	4. Clay		4. Gifted	4. Other (Specify) _____
5. Not used	5. Other (Specify) _____			5. Newly occupied	
6. Given out				6. Rented	
7. Other (Specify) _____				7. Other (Specify) _____	

G. Harvest Quantity

1. Describe (Excellent, Good, Fair, Bad, Failure, etc.)
2. Number of Bags, bowls, etc.

H. Staple Crop Information

List 5 significant sources for price of staple commodity	Did this information assist you in your selling decisions (Yes/No)?
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____

I. Livestock and Animal Form

Does the household own animals? Y or N

Does the household used to own animals in the past? Y or N

Did the household lose any animals in the past one year? If yes, number lost and how? Y or N _____

Animal Form

Type	Number of fully grown in possession	Number of young in possession	Has the number of animals 10 years ago increased, decreased or remained equal? And note the reason for such a trend.	Use:
Cows				
Horses				
Pigs				
Chicken				
Ducks				

Is the household sometimes forced to sell animals in order to buy other food products to feed the family? Y or N